

POWERS

TEMPERATURE REGULATION



The Elimination of Heat Waste

POWER TEMPERATURE REGULATION

The Elimination of Heat Waste



Three Decades of Successful Heat Regulation

THE HIGH STANDARD OF PERFORMANCE of the Powers System of Heat Regulation has been proven through three decades of continued, successful operation. This record of performance results from utilizing a correct basic principle—a principle so simple in application that the Powers thermostat requires but a single moving unit.

The first Powers System for the control of living room temperatures used this principle. Since then the system has been applied to every size and type of heating plant, always giving a durability and persistence of operation that is unique in mechanical work.

Every care is taken in producing the simple mechanism that utilizes this principle. The user rightfully expects automatic heat regulation to take care of the room temperatures so completely that the apparatus itself may be forgotten. This result is secured in the Powers System through the use of equipment that is of simple, rugged design, and by maintenance of the highest standards in manufacture and installation.

The Powers Regulator Company

New York • Chicago

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Boston	Cleveland	Seattle	Los Angeles
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Canadian Powers Regulator Company, Ltd.

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Overheat — A National Waste

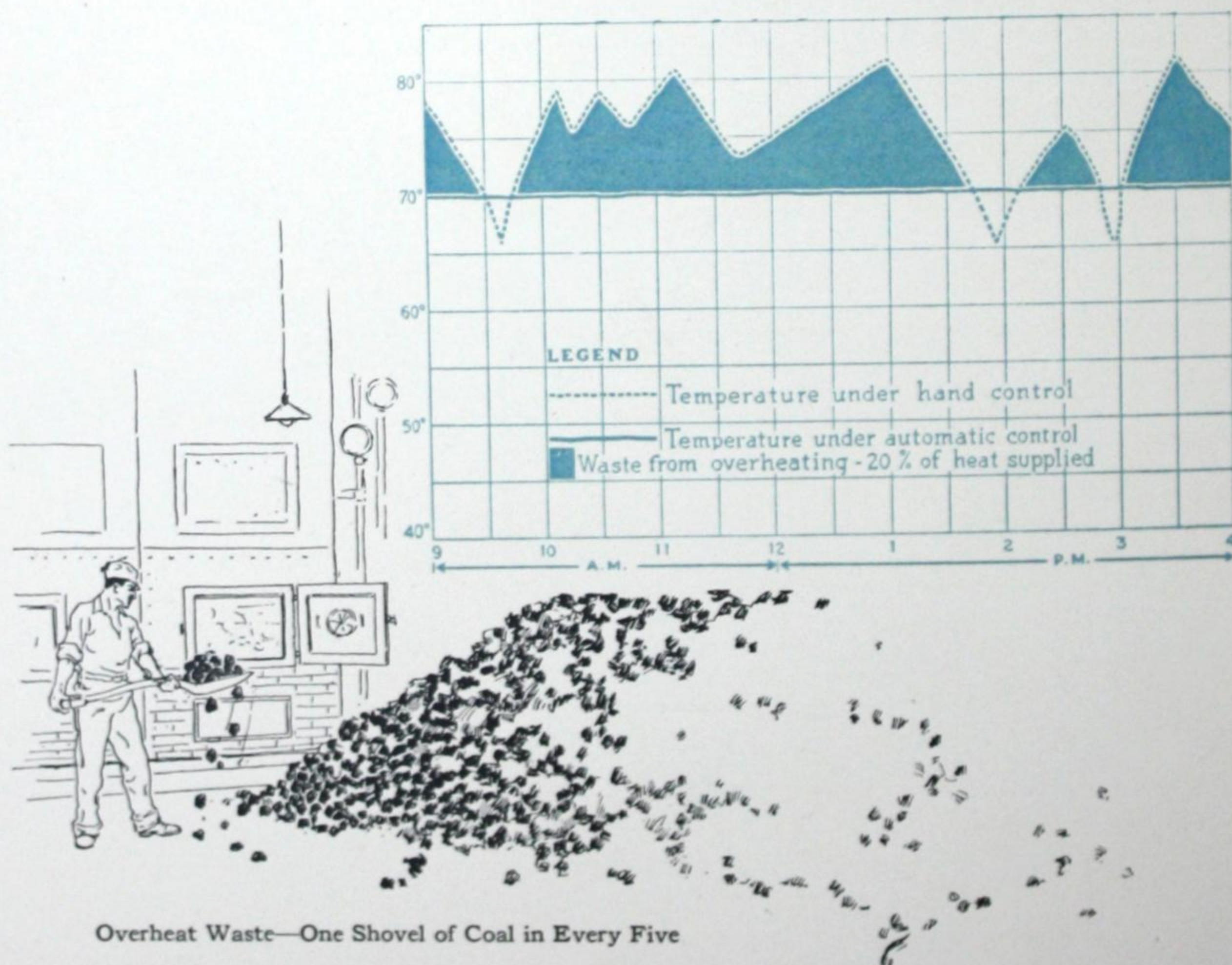
The present scarcity and high price of coal have brought into sharp relief the fuel waste caused by inadequate control. This waste takes two forms—Excessive temperatures and waste of heated air through open windows.

Overheating has become a national habit because it offers an easy way to avoid the discomforts of underheated buildings. It is the invariable result of hand control. Of course it is wasteful. It was expensive even with the low-priced, abundant fuel of a decade ago. It is unhealthful, uncomfortable, and unsanitary.

The diagram below gives some conception of the cost involved. The mean or average temperature for the entire heating season in Chicago or New York is 45 degrees. To maintain a living room temperature of 70 degrees sufficient heat must be supplied for a 25 degree temperature raise. If the average room temperature increases to only 75 degrees under hand control it is obvious that this 5 degree excess means a fuel waste of 20 per cent, as indicated by the black area in the chart.

Overheating with its resultant discomfort and waste is impossible where the temperature is controlled by a Powers System. Heat requirements indicated by minute temperature changes are translated into an adequate actuating force by the simple, rugged thermostat and valves and dampers are regulated so quickly to the exact position needed that they actually seem to anticipate the demand.

Such regulation is obviously desirable at any time. With present fuel conditions it has become an imperative need.

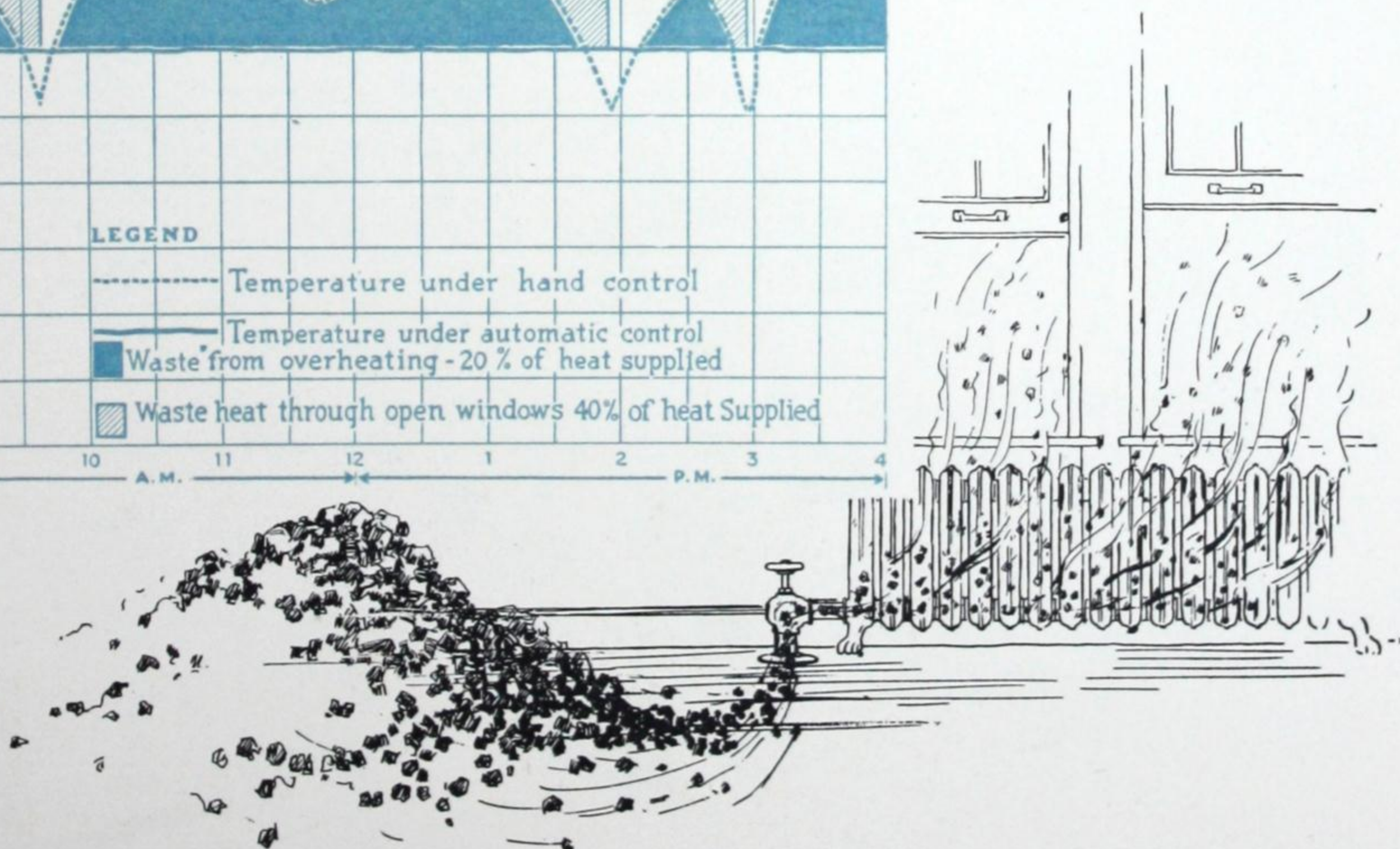
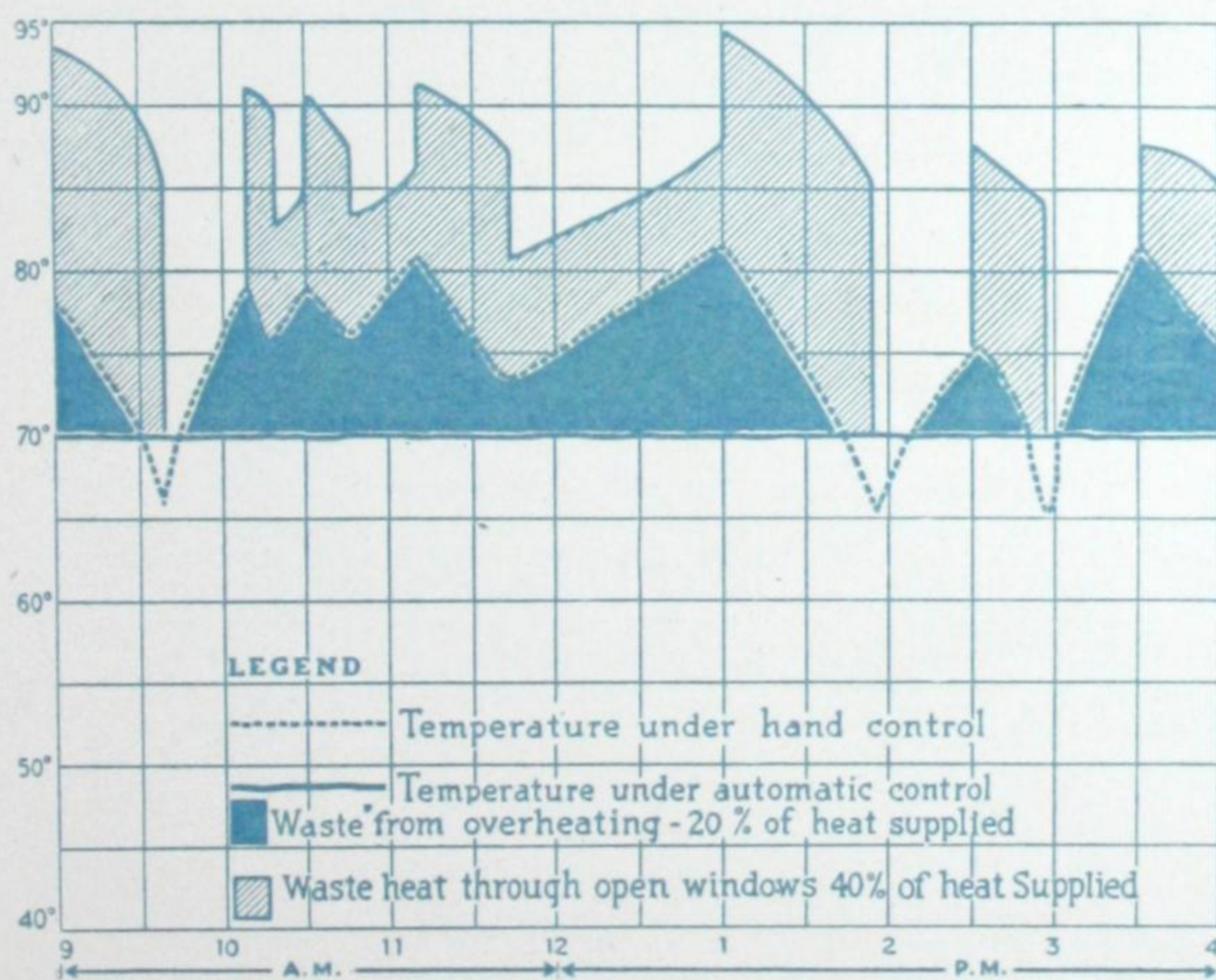


When Fuel Flies Out of the Window

With hand regulation of room temperatures the window rather than the radiator valve is frequently used for control. When the room becomes hot, the natural procedure is for one of the occupants to open the windows far in excess of any ventilation requirements. Then when the room becomes chilled and uncomfortable, down come the windows for a short period until the room again becomes overheated, when the cycle is repeated. The result is that during a large part of the day heat is being wasted through open windows. For the rest of the time the room is either chilled, or, overheated and stuffy.

Calls for more heat and complaints of cold rooms may come during a period when the heat furnished is really far in excess of that required. When an over abundance of heat is released through opened windows, a flood of cold air is introduced. The temperature drops rapidly, usually going far below the proper level. For some time the room will be uncomfortably cold, as even a large excess in the heat supply will not immediately readjust the room temperature. The cold air, too, mixes slowly with the heated air. During this mixing process the cold air tends to keep to the floor of the room, chilling the occupants.

The "Open Window" loss is undoubtedly the greatest that comes from hand regulation. It accounts for the savings of 40 to 60 per cent frequently reported where Powers Systems are attached to heating plants previously regulated by hand. The curve below shows how the "Open Window" losses may double the excess heat loss, cited on the previous page.



Open Windows Waste—One to Two Shovels of Coal in Every Five

The Physiological Value of Heat Regulation

Medical authorities agree that proper room temperatures are essential to good health. Overheated rooms lower the individual's resistance to disease, especially his resistance to those ills affecting nose, throat, or lungs. This effect is most marked where the individual is seated, or where the nature of the work prevents offsetting the effect of improper temperatures by physical exercise.

Uniform temperature conditions besides being essential to good health, make for the full effectiveness of the worker in school, office, or shop. It is important in maintaining attendance and in keeping the individual at maximum efficiency. In addition, by promoting the comfort of the worker, it reduces, often to a surprising degree, the annual labor turnover.

No altruistic consideration is needed to justify the installation of a Powers System for maintaining comfortable temperatures for employees. Pleasant and healthy conditions pay handsomely in tangible dividends of better attendance, reduced labor turnover, and improved and increased production. In many manufacturing operations uniform room temperatures are essential not only to the well-being of the operative, but for the proper quality of the product itself. This applies especially to the manufacture of such articles as food products, textiles, paper, confectionery, etc., where variations in the room temperature often cause a serious impairment in the quality of the product.

In the schoolroom, housing as it does growing children, a proper temperature is even more important. Here, in addition to increasing the effectiveness of the workers, it is invaluable as an aid to stronger and healthier constitutions.



Chilling temperatures are certain to cause inefficiency. Time is wasted adjusting windows and changing wraps—production suffers.

An office too warm is frequently the cause of more inefficiency than if the room were too cold. There is a temperature that is both healthful and comfortable. The best work is done in rooms kept at just that temperature.



The Heart of the System—the Thermostat

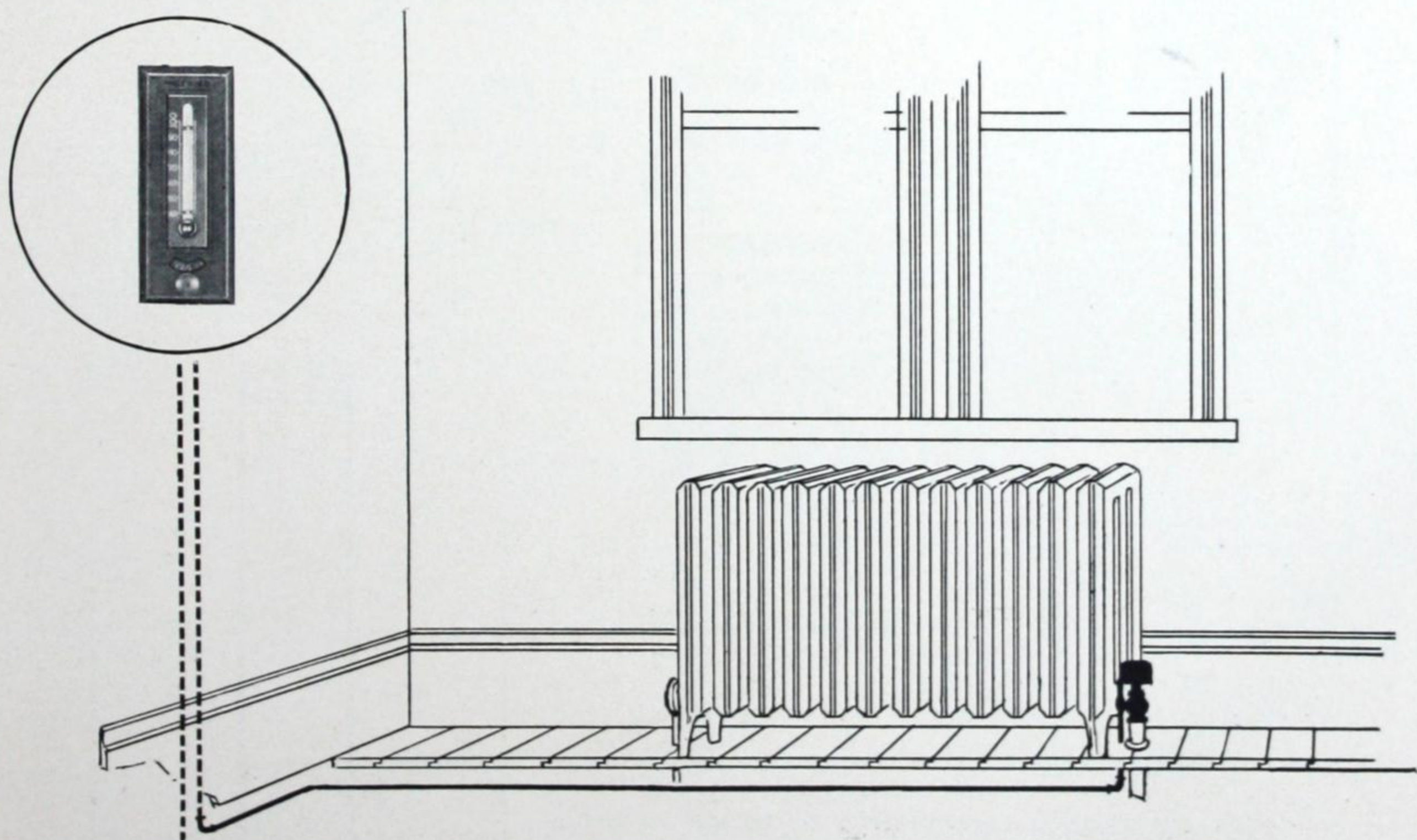
Automatic Temperature Control supplants the unreliable, wasteful, and always unsatisfactory hand regulation of valves and dampers on a heating system. Steam valves for instance, open wider automatically as the temperature falls slightly, and close proportionately if the room temperature rises.

In this automatic system the valves and dampers are operated by compressed air, this compressed air being under the control of an actuating instrument called the thermostat.

The thermostat, then, is the heart of the system. Its action is induced by a slight change in the surrounding temperature and transmitted to a small valve that admits or exhausts the compressed air, which moves valves or dampers as required. Inasmuch as this action of the thermostat is secured from very slight temperature changes, it is evident that the instrument must be extremely sensitive. Obviously an instrument that would respond only to great variations would defeat the main purpose of automatic control—a constant temperature.

The problem, then, in designing this thermostat was to provide an instrument which, while sensitive to the slightest temperature changes, would be powerful enough to operate its air valve without the use of motion or power amplifying devices.

The solution of the problem was the Powers Thermostat with its abundance of power and complete absence of levers, delicate parts, and complicated mechanism.



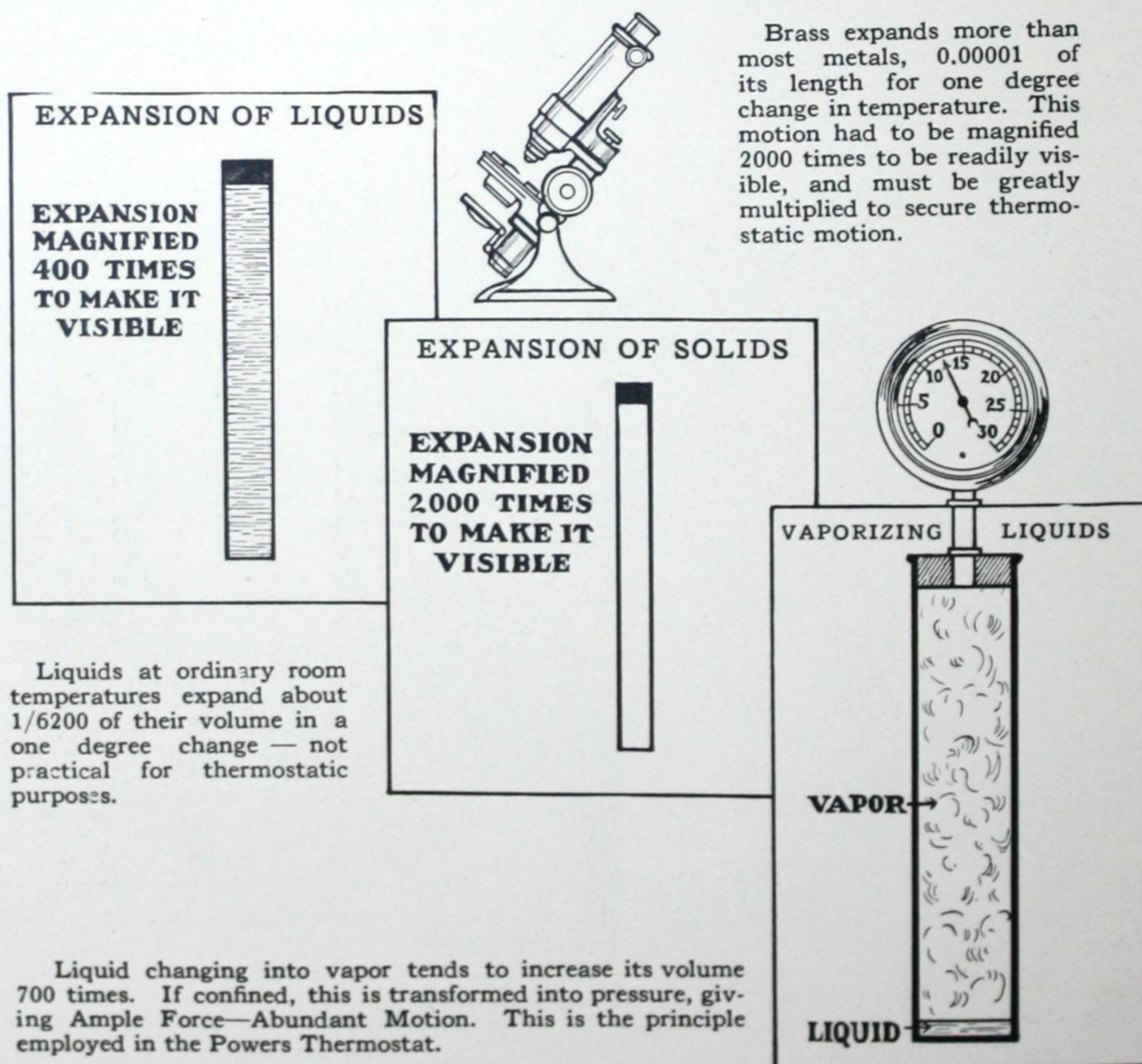
In automatic Temperature Control the heat controlling Valves and Dampers are operated by the Thermostat through the medium of compressed air.

The Powers Thermostat—Why It Is Unlike Any Other

The Powers Thermostat attains its remarkable efficiency, and differs from all others, in the employment of a principle that is extremely simple but tremendously effective. To obtain its power it employs the principle that is familiar to all of us in the steam boiler. James Watt watched the steam lift the lid of the kettle and applied the observation to the development of the steam engine. Powers uses the identical principle except that instead of water he uses a more volatile liquid which will boil at ordinary room temperatures. A small quantity of this liquid is confined in the expansion disc of the thermostat where, by vaporization, or boiling, it develops a pressure that is always proportionate to the temperature of the room. A slight increase in the temperature of the room develops a corresponding increase of the pressure within this disc. A fall in temperature lowers this pressure, just as changing the heat supply under a boiler varies the steam pressure.

Thus we get the real thermostatic force that makes possible the remarkable work accomplished by this instrument.

**BELOW ARE SHOWN THREE WAYS THAT PHYSICAL MOTION
CAN BE OBTAINED FROM A ONE DEGREE
TEMPERATURE CHANGE**



The Vapor Disc—More than Automatic—Infallible

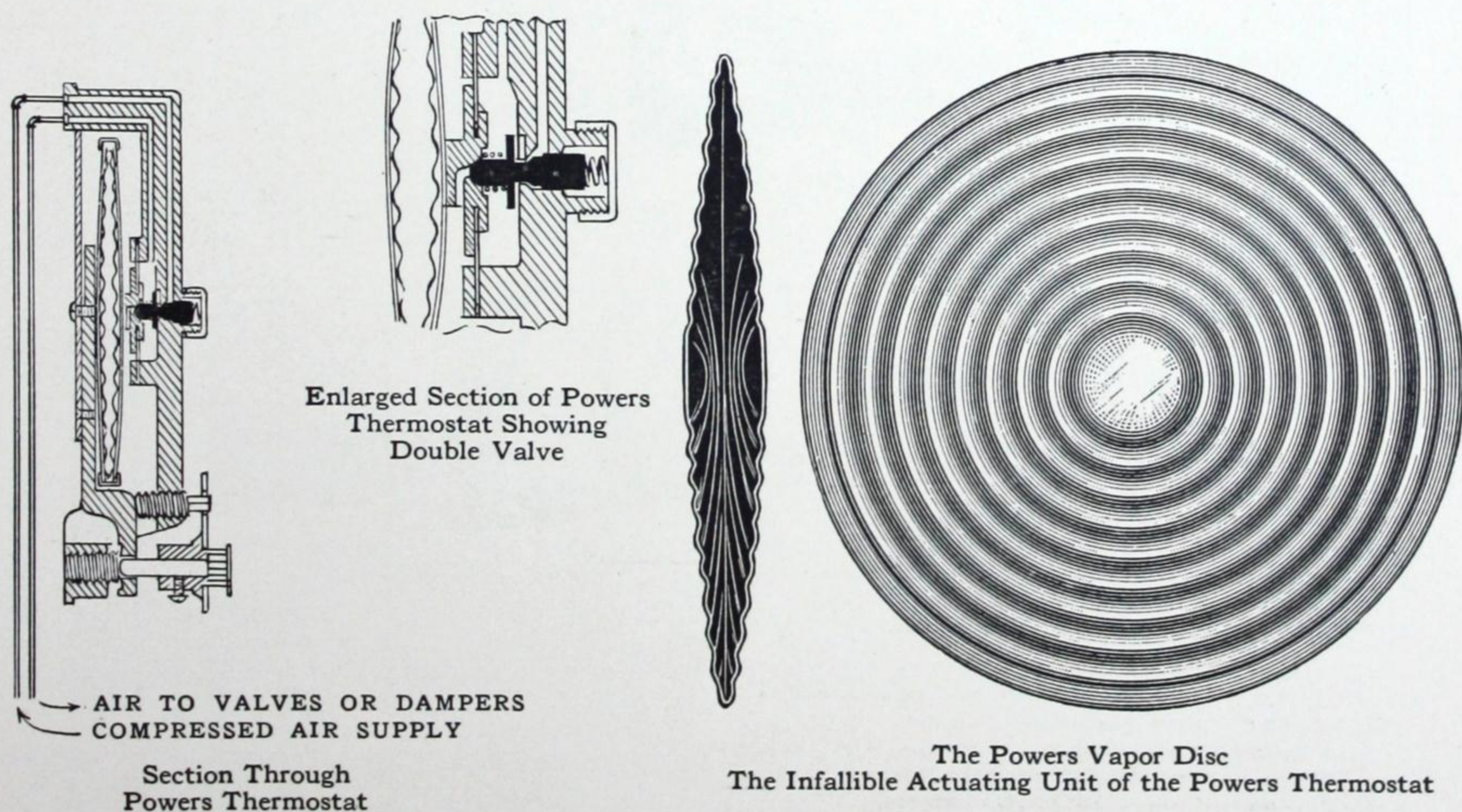
The liquid used in the Powers Thermostat is hermetically sealed in the vapor disc, which forms the thermal element. This disc has flexible, corrugated sides so formed as to make them elastic and is made of the finest grade of phosphor bronze, specially rolled for the work. These vapor discs are absolutely permanent and are guaranteed for all time.

The operating power, as we have said, is furnished by the volatilization of this liquid. The room temperature thus creates a pressure, the disc expanding and contracting with variations in this pressure precisely in accordance with the temperature changes to which it is exposed.

The pressure developed by the volatilization of a confined liquid is a constant, therefore the adjustments of the Powers Thermostat never change of themselves. Instances are recorded where Powers Systems temporarily held out of service for years have upon resuming service functioned with perfect accuracy.

An outstanding feature of the Powers Thermostat, then, and one which distinguishes it from all others, is that it is not only automatic in its operation, but always *consistent*. Its thermal element, though exposed to extremes of summer temperature for months, and the occasional chill of unheated rooms in winter, develops no error in its adjustment. It has no multiplicity of moving parts to get out of order. It is more than automatic—it is infallible.

**A POWERS SYSTEM TAKES HOLD IN THE FALL WHERE IT LEAVES
OFF IN THE SPRING**

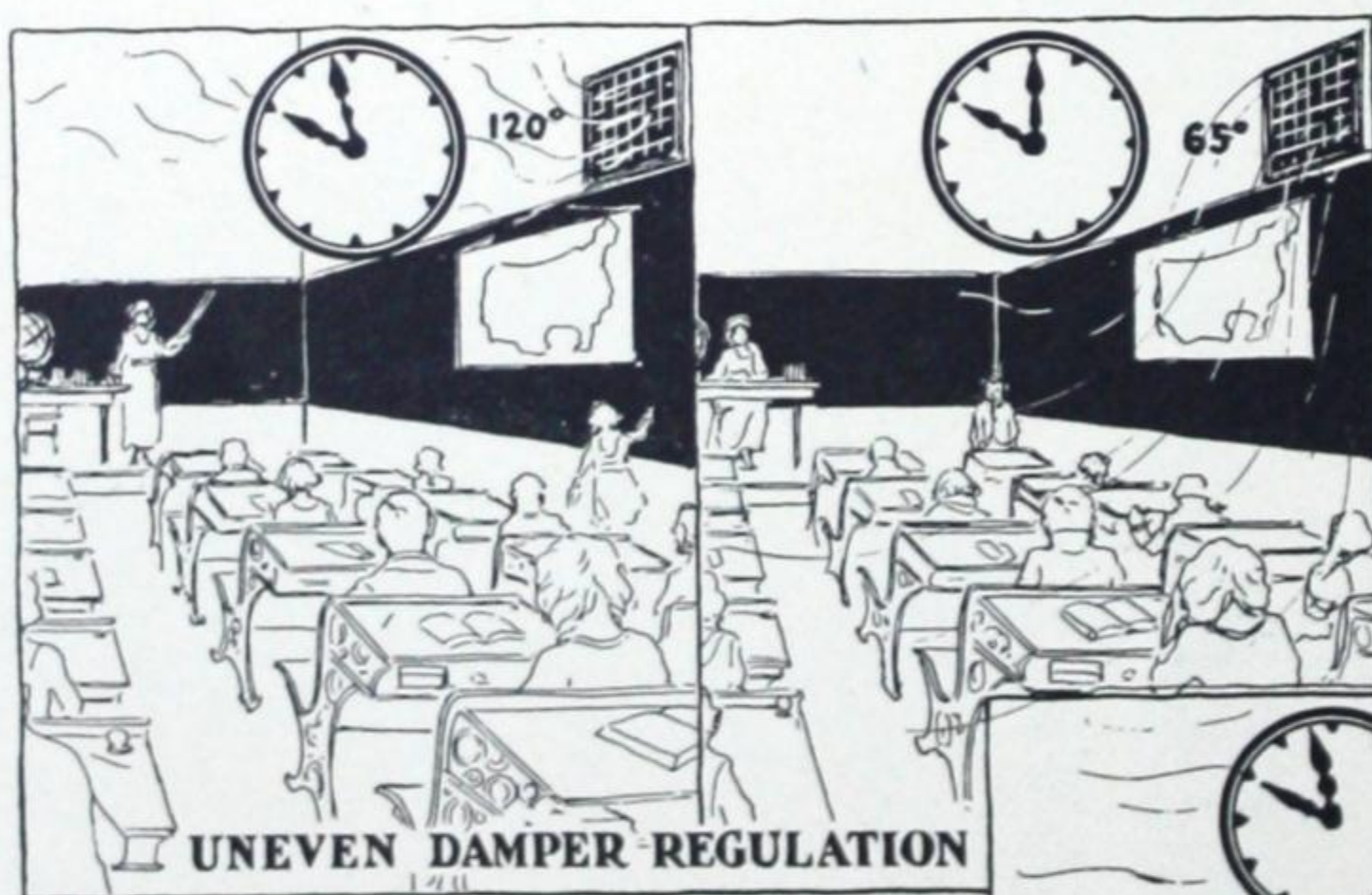


Graduated Control—Exclusive Powers Feature

When more heat is needed in a room the proper way to get it is to open a valve or damper to a definite position corresponding to the increased requirement and then hold that position until the requirement changes. To operate the heat controlling valves or dampers alternately wide open and completely closed is obviously wrong—like driving an automobile by spurts and stops, alternately turning on and shutting off all of the power. Yet, in the control of the heat source, only the Powers System obtains true graduated action, holding valves or dampers sufficiently open so that the necessary heat is steadily delivered to maintain the correct temperature.

In the Powers Thermostat the powerful vapor disc operates a double valve—controlling both supply and exhaust of the compressed air, thus acting as a reducing valve giving just the air pressure required to correctly position the heat controlling valves and dampers. Both the exhaust and supply cannot be open at one time—there is no continuous air waste. The valve or damper is positioned, then the air consumption ceases until further change is required. Excessive use of air introduces large quantities of dust and moisture into the system with resulting clogging, and corrosion of air lines and mechanism. The Powers System—using only five to ten per cent of the air required by other systems—eliminates these troubles. There are no finely restricted air passages or leak ports, no motion multiplying devices. The powerful vapor disc controls its double valve and the work is done.

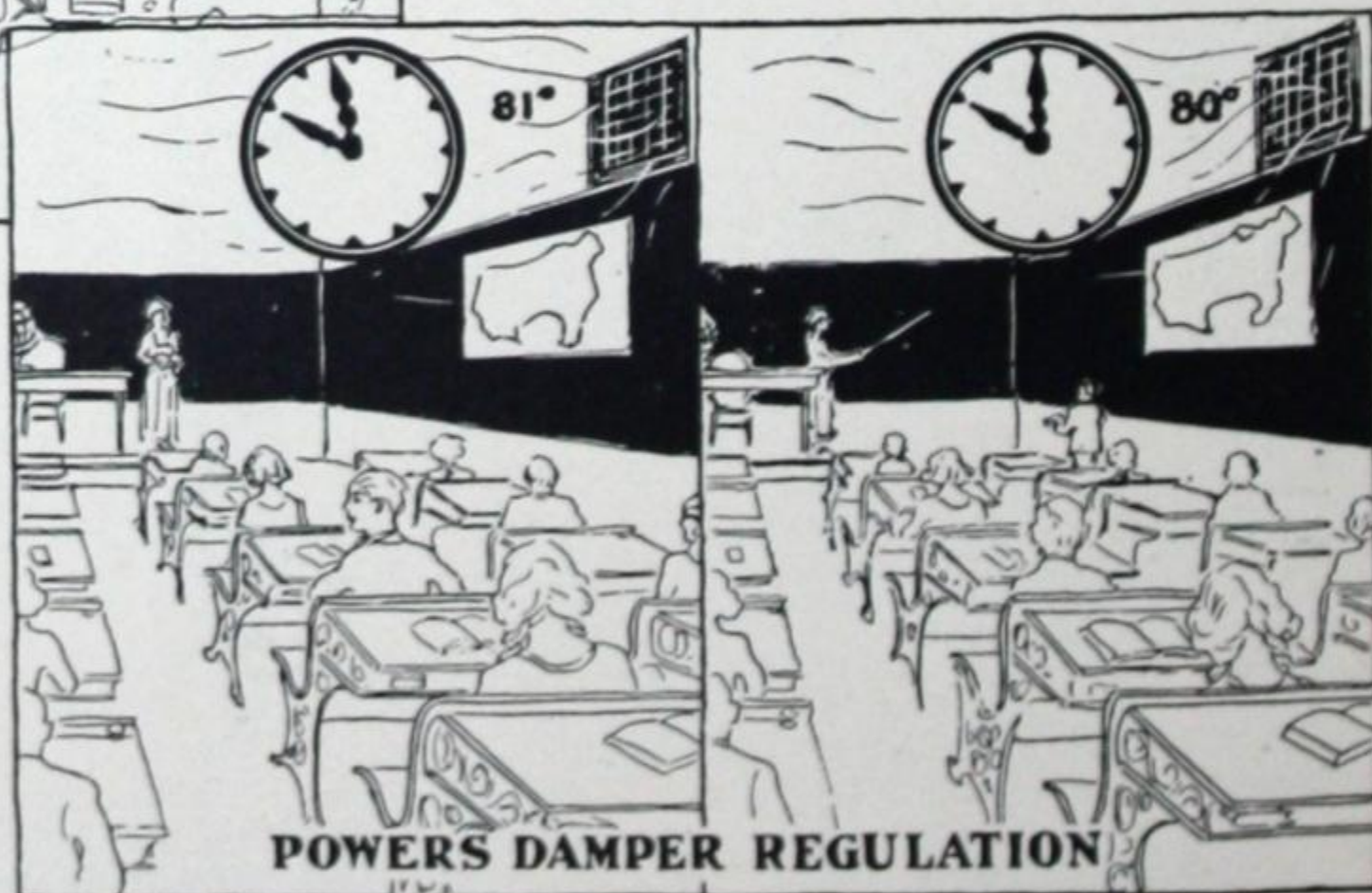
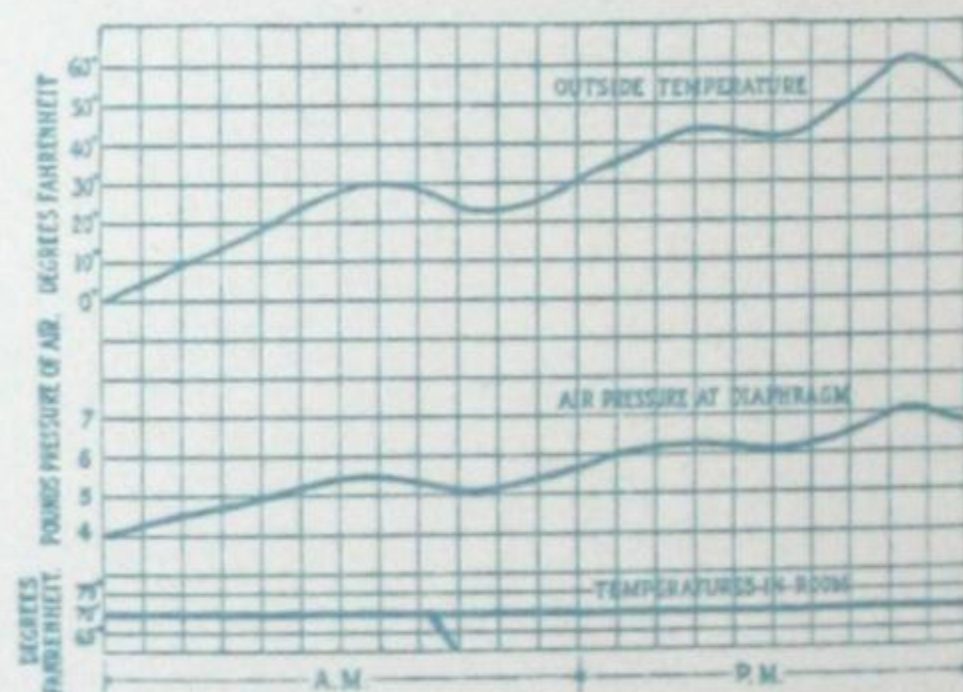
The chart below shows how the compressed air pressures at the diaphragm motor vary directly with the heat demand throughout a range of 60° in outside temperature.



Room temperature will fluctuate under this condition

Above—At one minute air from the reheating chamber is being blown in at 120°; the next minute air is admitted from the tempered air chamber at 65°. The colder air falls on children—dangerous to health.

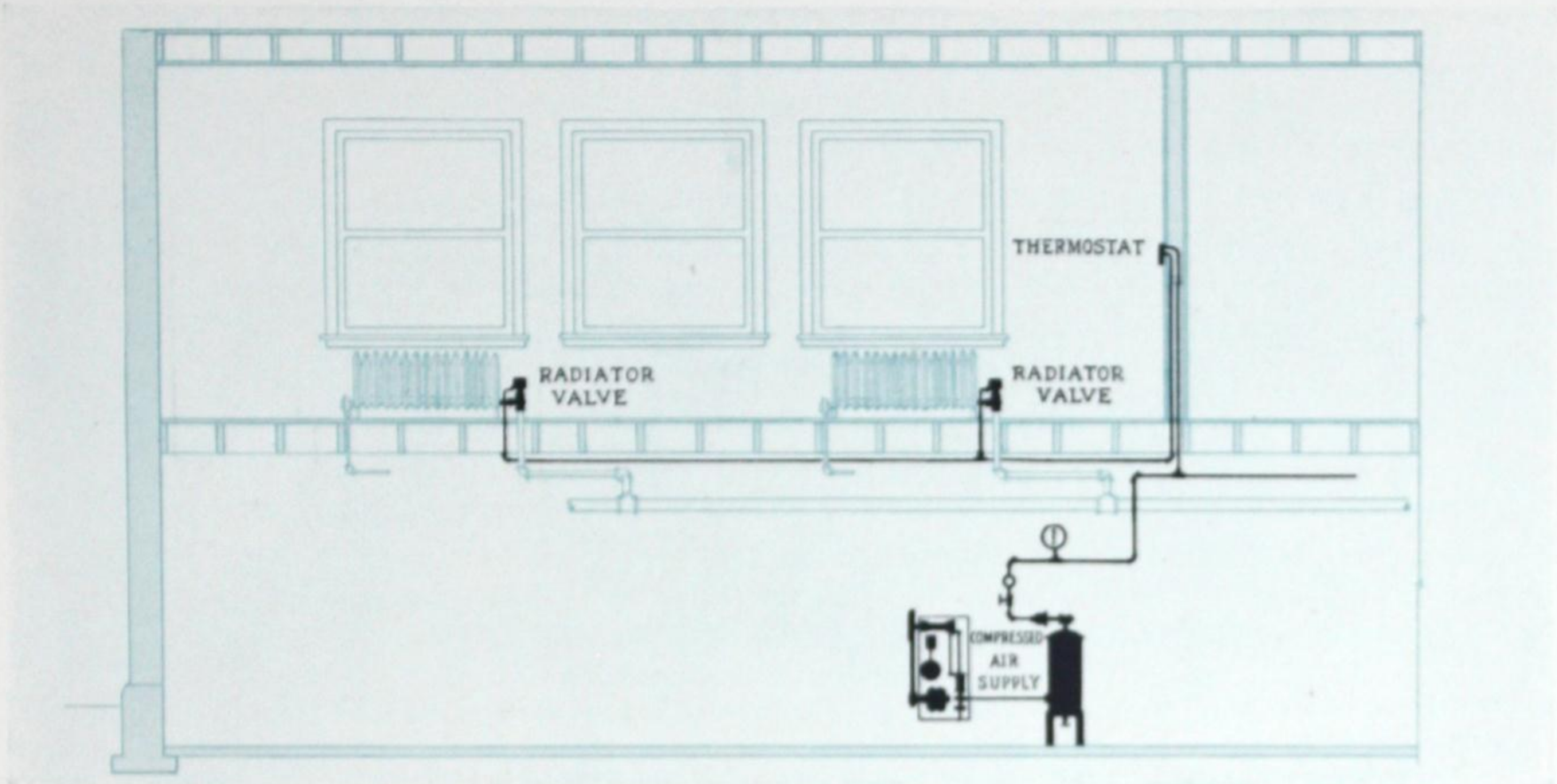
At the right the Powers Thermostat adjusts mixing dampers gradually—temperature of incoming air changes gradually, just enough to keep the room temperature uniform (usually about 70°). No dangerous drafts—no bad physiological effect.



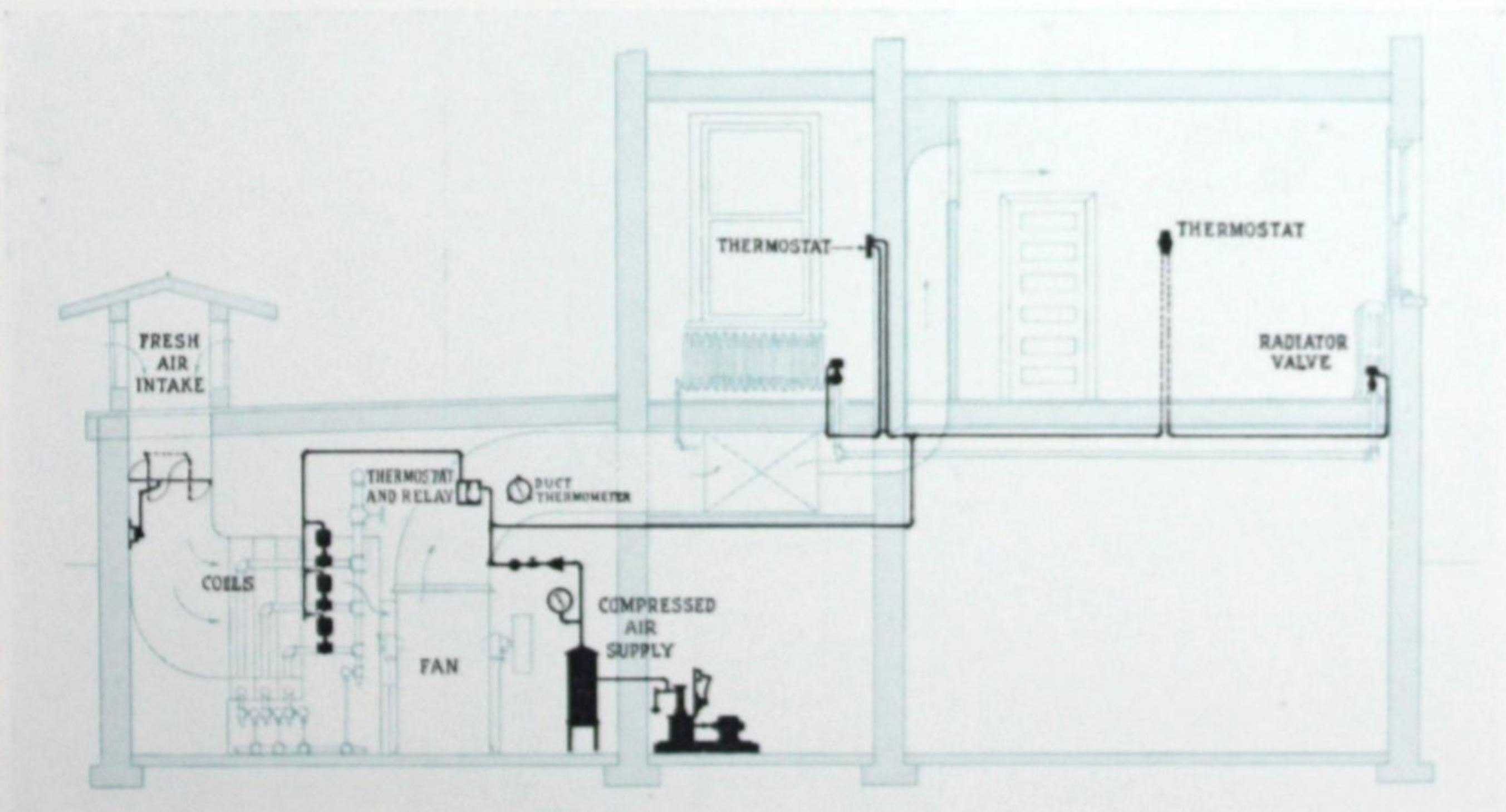
Room temperatures always the same

Application of Powers Temperature Control

The Powers Temperature Control System consists essentially of the thermostat, a source of compressed air, concealed piping to carry the air at full pressure from source to thermostat, and at regulated pressures from the thermostat to specially designed valves and dampers that control the heat supply. The following illustrations show how this control operates in connection with typical heating and ventilating systems.

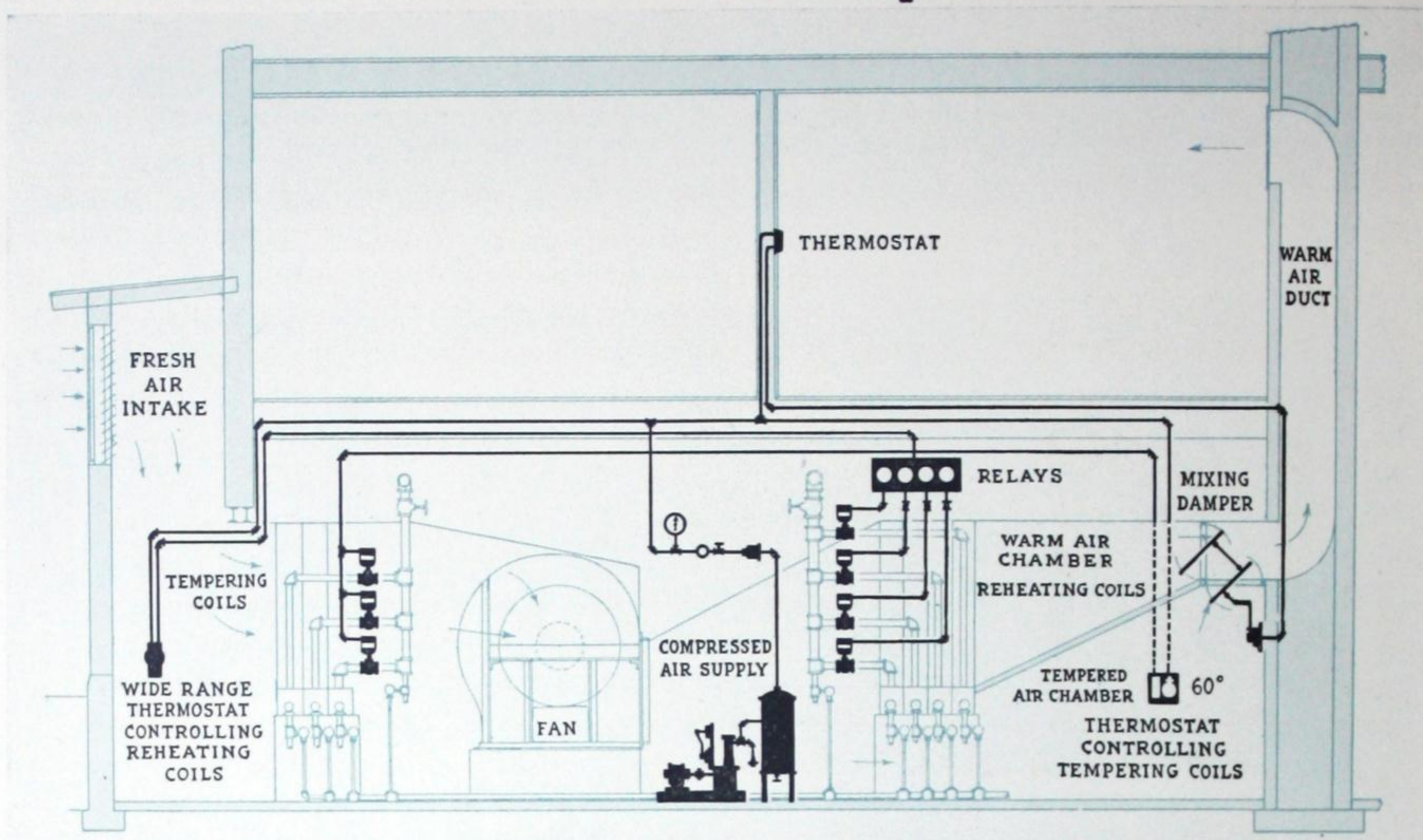


1. **DIRECT HEATING SYSTEM**—Rooms heated by direct radiation from steam, vapor, or hot water radiators. Thermostat in room controls valves on radiators to maintain proper temperature.

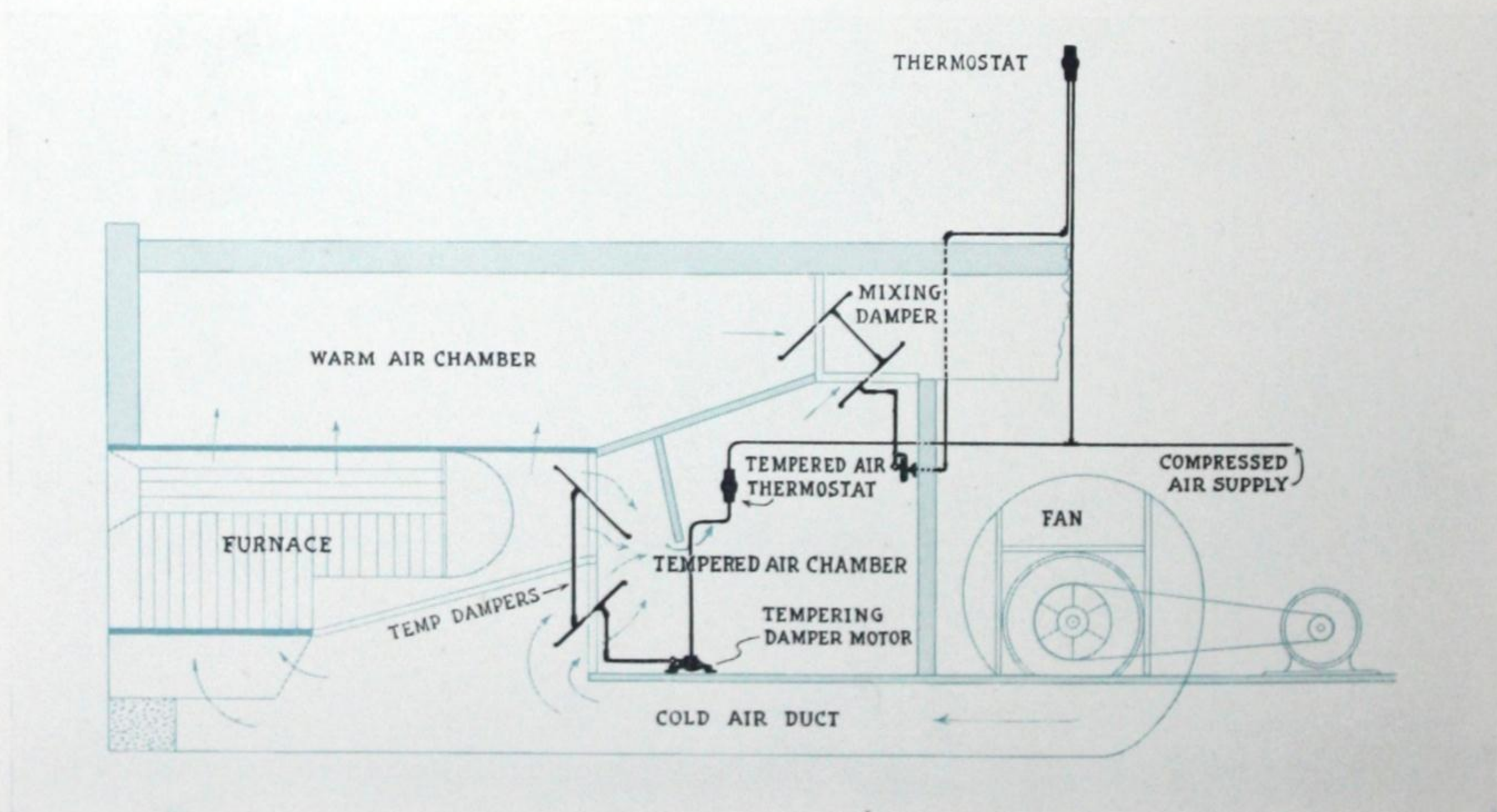


2. **COMBINATION (SPLIT) SYSTEM**—Direct radiation supplies the heat; fan supplies warm air for ventilation. Thermostats control valves on radiators to maintain proper room temperature. Ventilating coils are controlled by a thermostat placed in the fan discharge duct.

Application of Powers Temperature Control



3. **PLENUM SYSTEM** of Heating and Ventilating—Air tempered and reheated by steam coils, and circulated by fan. A Thermostat in the tempered air chamber maintains 60° by controlling valves on tempering coils. A wide range Thermostat shown in the fresh air intake controls valves on the reheating coils, opening and closing them progressively as the outdoor temperature fluctuates. Thermostats in the rooms control mixing dampers which properly mix the reheated and tempered air before it reaches the rooms.



4. **FAN FURNACE**—Furnishing air for both heat and ventilation. Air is heated by the furnace—a portion of this air being deflected to a tempering chamber where it is mixed with cold air to give the desired temperature. Thermostats in the rooms control mixing dampers to properly mix tempered and hot air before it reaches the room. A Thermostat in the tempering chamber controls dampers properly mixing the hot and cold air admitted thereto.

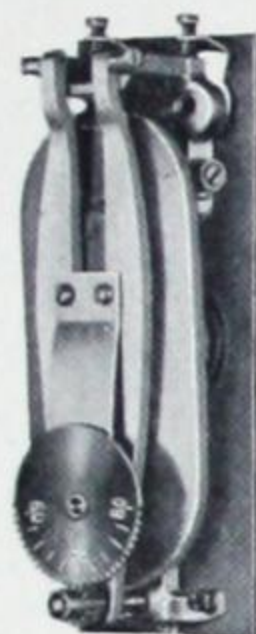
A Powers Thermostat for Every Purpose

An outstanding constructional feature of the Powers Thermostat is its great simplicity—the absence of delicate levers, springs and motion multiplying devices, restricted air passages and leak ports.

Where a small instrument is preferred, as in residence work, the type D Thermostat is used. The vapor disc and other mechanism have been reduced to the smallest dimensions compatible with efficiency, and are contained in a rectangular case measuring but 2x5 inches. The vapor disc is made in oval shape so as to give the maximum area for the space available. The cover is a die casting, perfect in its sharp lines and susceptible of the finest of electroplate finishes.



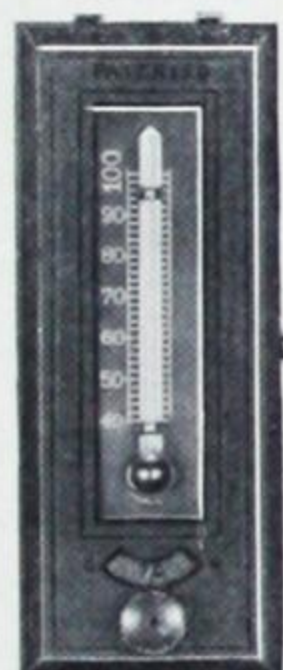
"D" Thermostat
Key Adjustment



"D" Thermostat
Cover Removed

For residence sleeping rooms, type D-2 is desirable. This thermostat is provided with a cut-out switch so that the heat may be entirely shut off at night if desired, but without disturbing the adjustment, so that when turned on again the room is immediately under control.

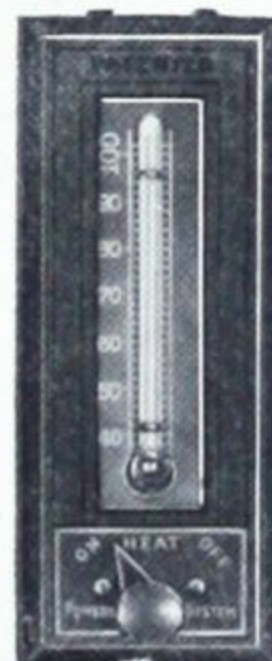
For offices, hotel rooms, etc., type D-3 has the advantage that the temperature adjusting device is concealed. A control switch is placed on the front of the cover and this switch permits occupants of the room to turn the heat on or off, but as the adjusting dial is under the cover, only authorized persons can change the adjustment which determines the maximum room temperature.



"D2" Thermostat
with Cut-Out Switch



Vapor Disc used in
"D" Thermostat



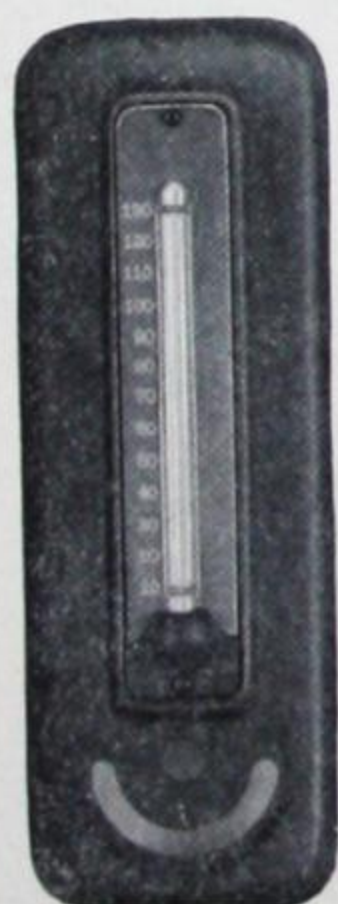
"D3" Thermostat
with Control Switch and
Concealed Adjustment



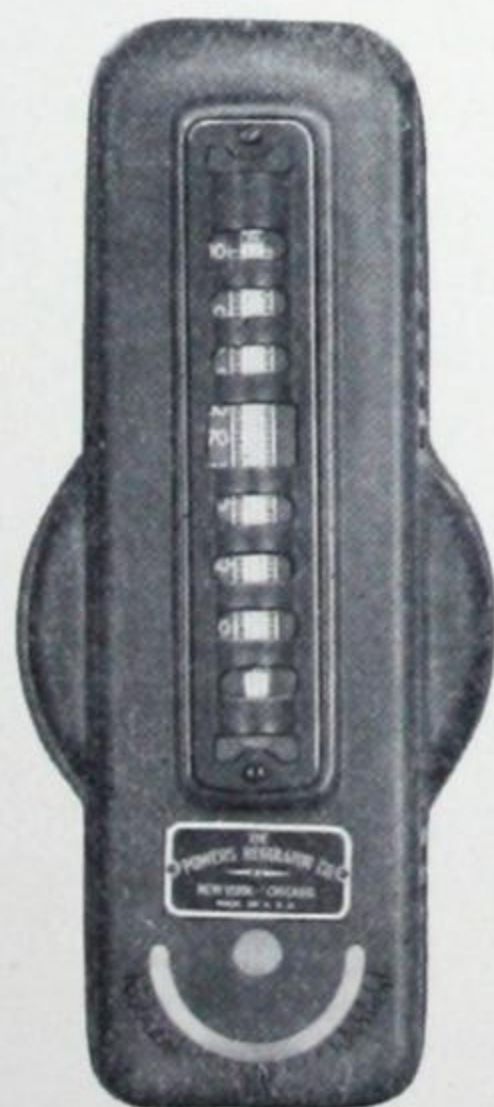
"D3" Thermostat
Cover Removed

The type A thermostat is a medium sized instrument, adapted for use in offices, schools, etc. It has the standard circular vapor disc and cover of pressed metal.

The type K is a powerful thermostat adapted to the severest use. It is of exceptionally rugged construction and is recommended for schools, factories and all places where ability to withstand the hardest service is an essential. Its cover is a one-piece steel stamping with guarded thermometer bulb.



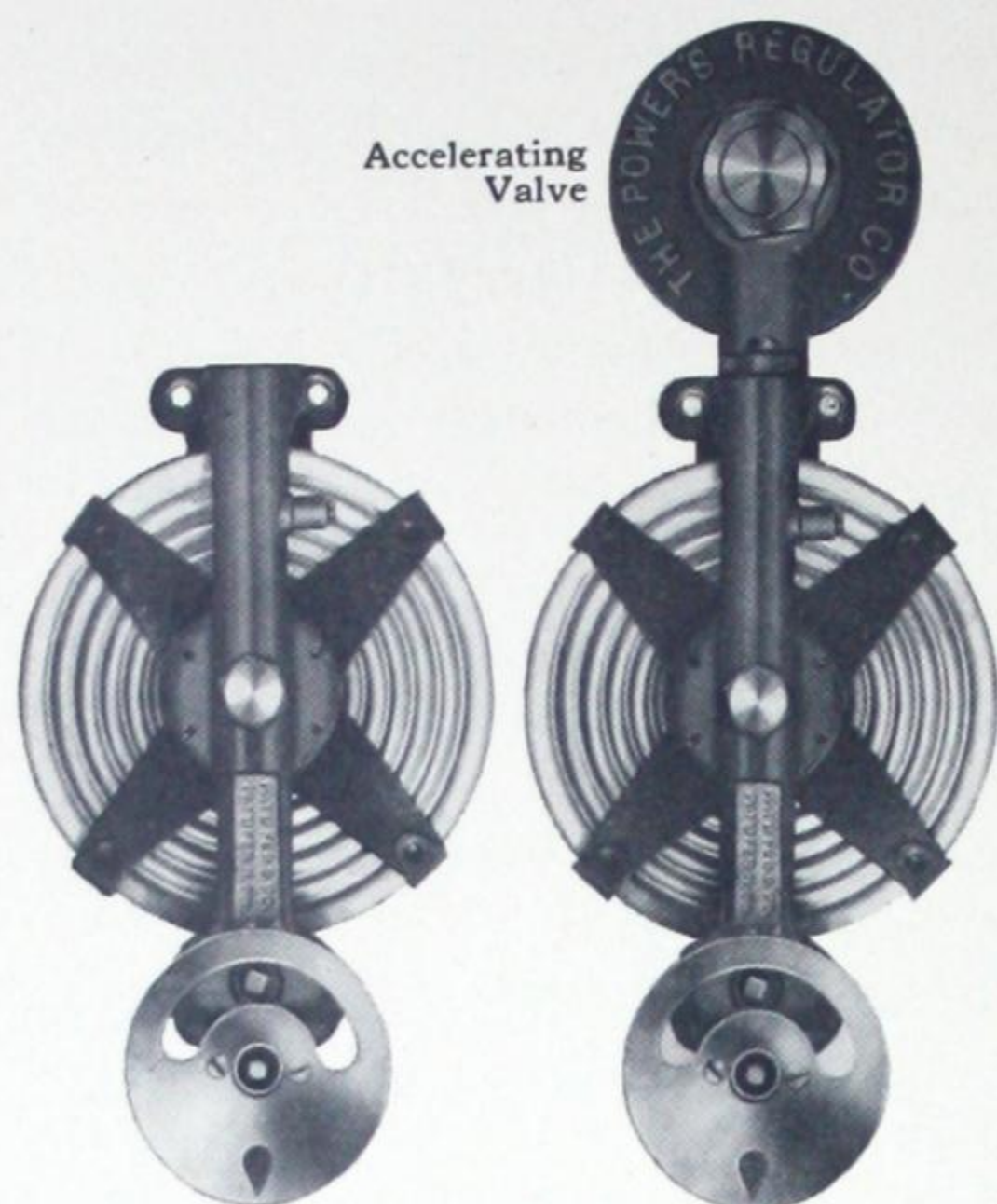
"A" Thermostat
with Cover



Thermostat Cover with Protected
Thermometer—used with Types K, L & M

A Powers Thermostat for Every Purpose

POWERS THERMOSTAT FOR POSITIVE ACTION



"K" Thermostat without Cover

"L" & "M" Thermostat without Cover

The single pipe or gravity steam heating system cannot be operated with valves part way open. The valve must be either fully open or tightly closed. This requires that the thermostat have a "positive" action (as contrasted with the "graduated" action so desirable for other systems—see page 8), and must permit of only two valve positions. It either allows the full pressure of air to pass the thermostat and act on the diaphragm to completely close the valve, or it entirely releases the air pressure so that the valve completely opens. The Powers Thermostat obtains this action by the addition of an *accelerating valve*.

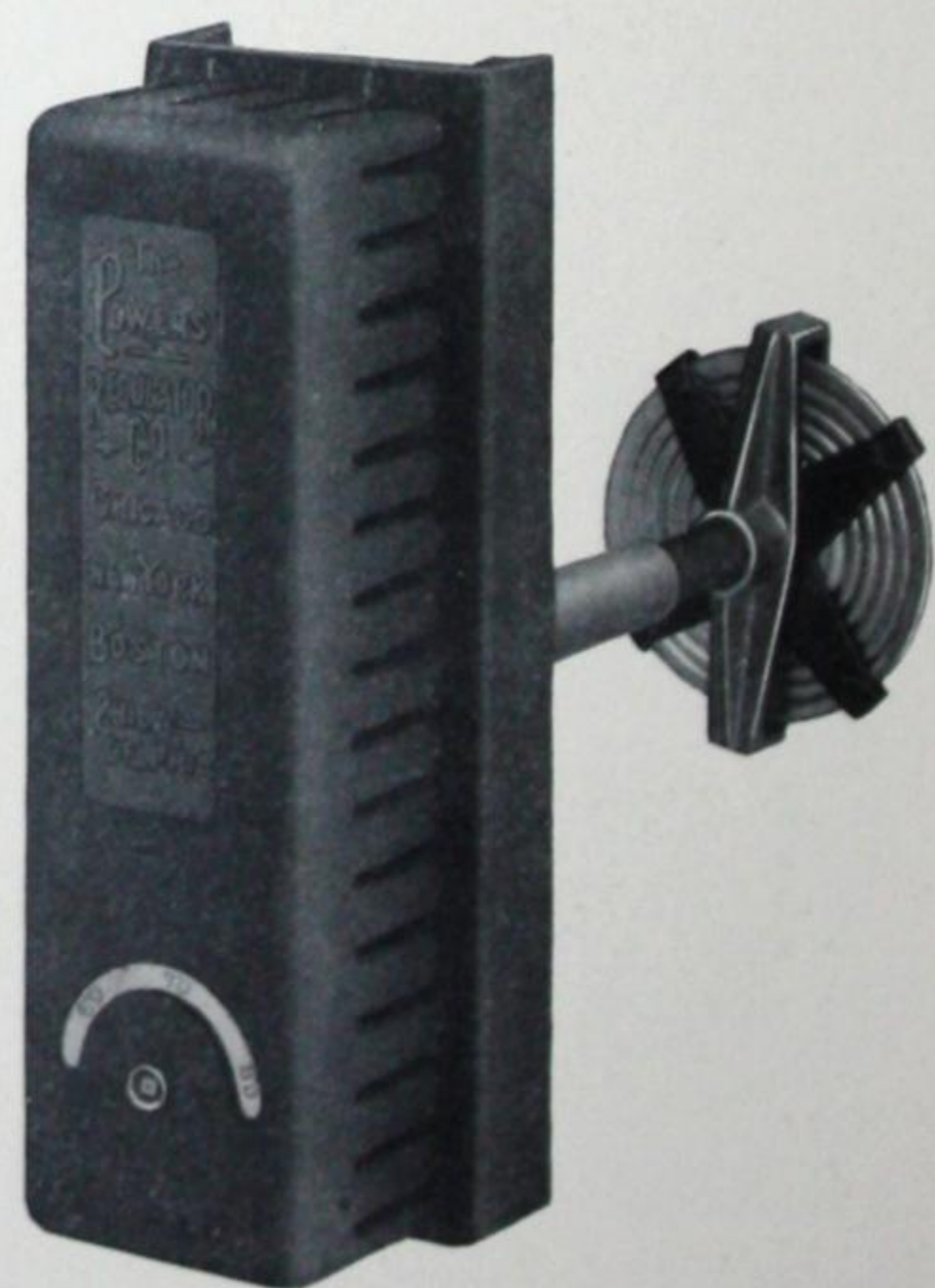
This valve is incorporated in the D, A or K thermostats, in which case they become our types E, B and L, respectively. No change in the exterior appearance of the instruments is involved but with the addition of this accelerating valve the instruments become positive in their action.

POWERS COMPOUND THERMOSTAT

By tapping into the gradual pressure chamber of these positive instruments, and running a separate air line to damper control, a compound thermostat (Type M) is developed which will give graduated control to mixing dampers and at the same time positive control to radiator valves. This compound Thermostat is an exclusive Powers development, and is the only instrument that will successfully control combination systems where the radiator valve must be closed positively, and in advance of the gradual operation of the mixing damper. It is an essential either on combination heating systems comprising plenum chamber duct distribution with one pipe direct radiators, or in the one pipe gravity unit ventilating systems described later. (See note, page 20.)

POWERS DUCT THERMOSTAT

For the control of fan heating systems, tempered air chambers and ducts, the type K thermostat is furnished in the extension disc or duct type. This duct thermostat has an extension which projects the vapor disc into the heated space. Its action is communicated to the thermostat mechanism through a solid bar, without lost motion. As in all Powers thermostats, the operation of its air valve is direct, without the use of motion multiplying devices.



"K" Duct Thermostat

The Powers All-Metal Diaphragm Valves

The metal diaphragm is in bellows form and of the built-up construction, a series of flexible discs being formed and assembled by die process. These discs are made from a special grade of phosphor bronze of exceeding toughness and elasticity. They are formed without subjecting the metal to excessive strain or deformation so that perfect elasticity is assured. Any required number of sections may be used so that no disc is ever required to expand beyond its elastic limit and the full lift of the valve is always secured. All metal used in these valves is subjected to tests equivalent to more than 50 years of practical operation.

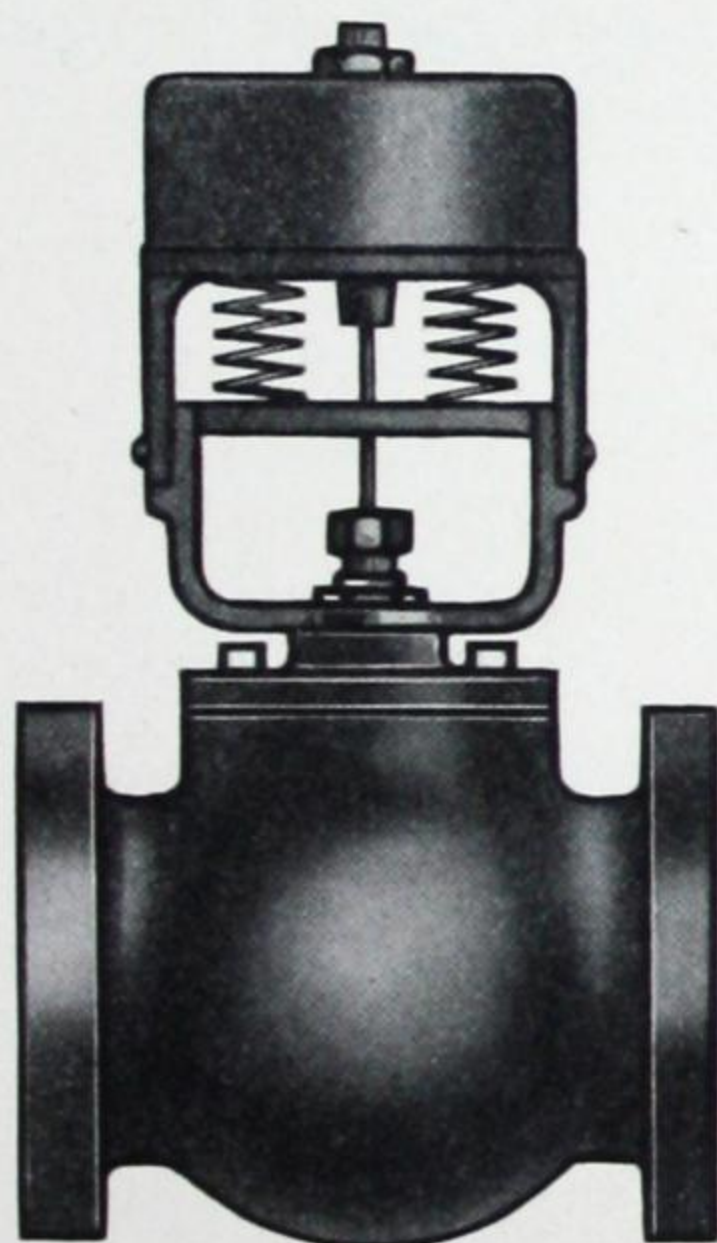
The all metal valve can be used with enclosed radiators and under other conditions involving high temperatures that are very destructive to rubber diaphragms.

THE RADIATOR VALVE

Powers radiator valves are made entirely of brass and bronze. They are small and compact—in ordinary sizes the top is only four inches in diameter—the smooth exterior gives a very pleasing appearance, is easily cleaned, and offers no dust catching surfaces. The finish is polished nickel unless it is desired to match other finish by painting or bronzing. The valves have bodies of bronze steam metal and are fitted with genuine Jenkins discs.

STEAM COIL VALVES

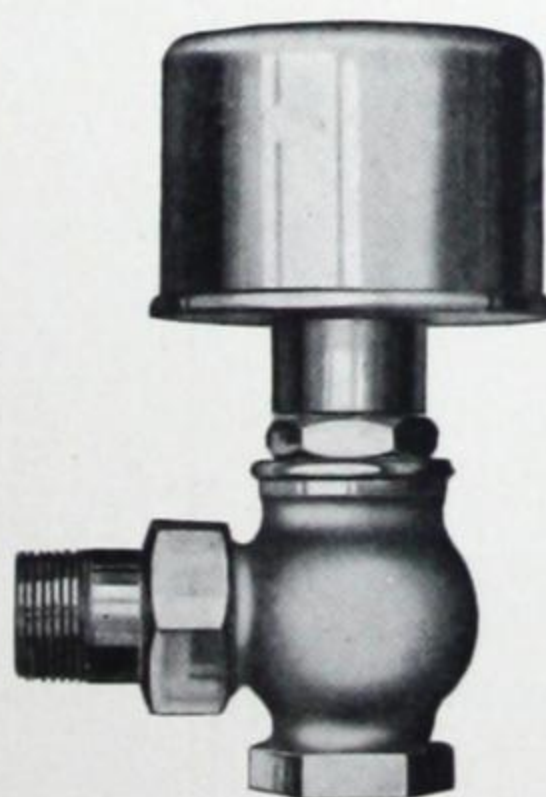
The valves used for the control of ventilating and heating coils have the same bronze bellows construction but enclosed in steel housings. They are made in all standard sizes and with bodies of all standard patterns.



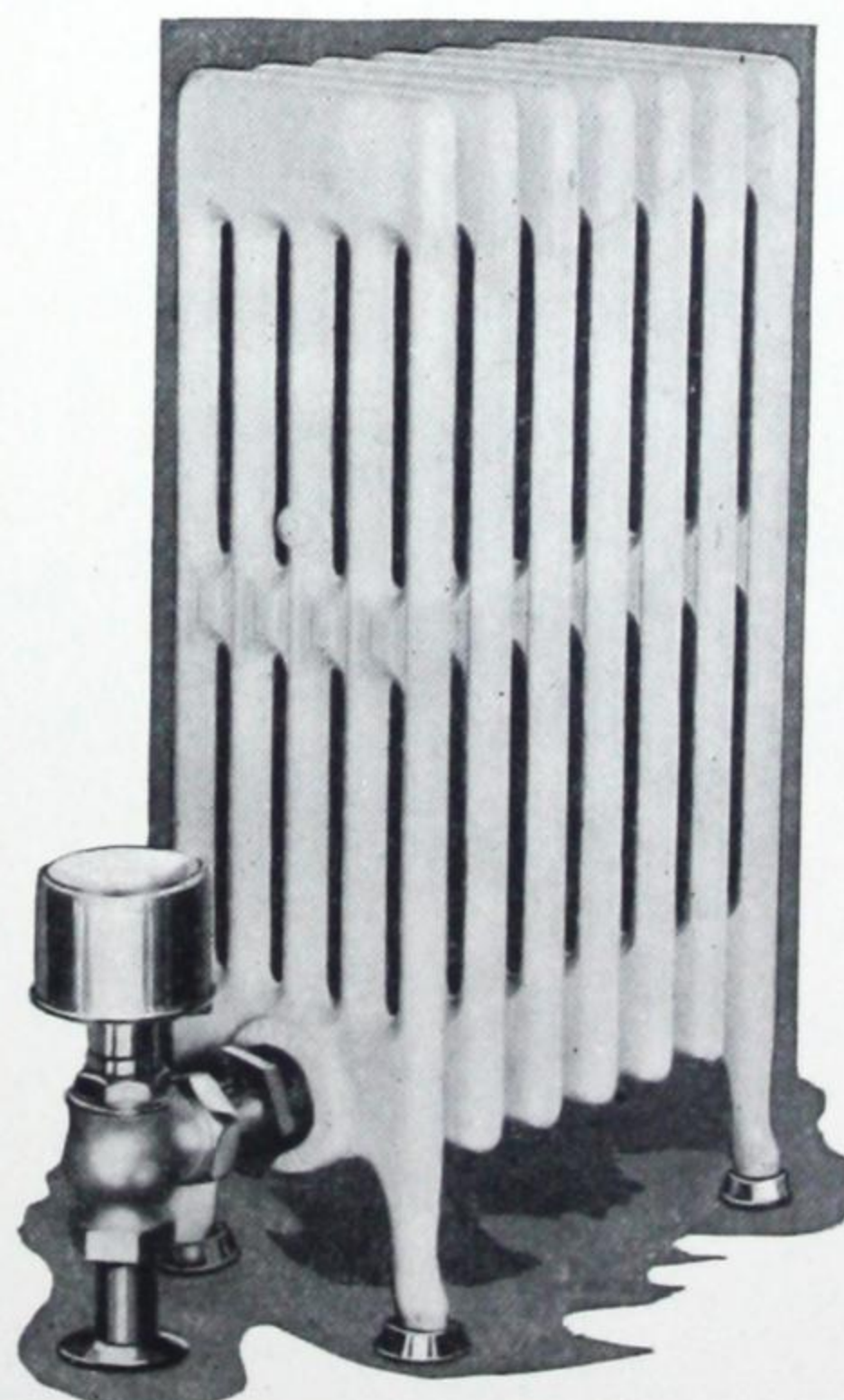
Powers All-Metal Valve
for Coil Control



Interior View of Radiator
Valve Top
Showing All-Metal Bellows



Powers All-Metal Radiator Valve



Radiator Equipped with Powers
All-Metal Diaphragm Valve

The Powers All-Metal Packless Diaphragm Valve

The Powers Packless Valve is designed for use with vapor heating systems. By doing away with the packing box all possibility of steam leakage and friction is eliminated, so that the valve responds perfectly to the graduated pressure afforded by the Powers Thermostat—giving the true modulated control which is the desired feature of vapor systems.

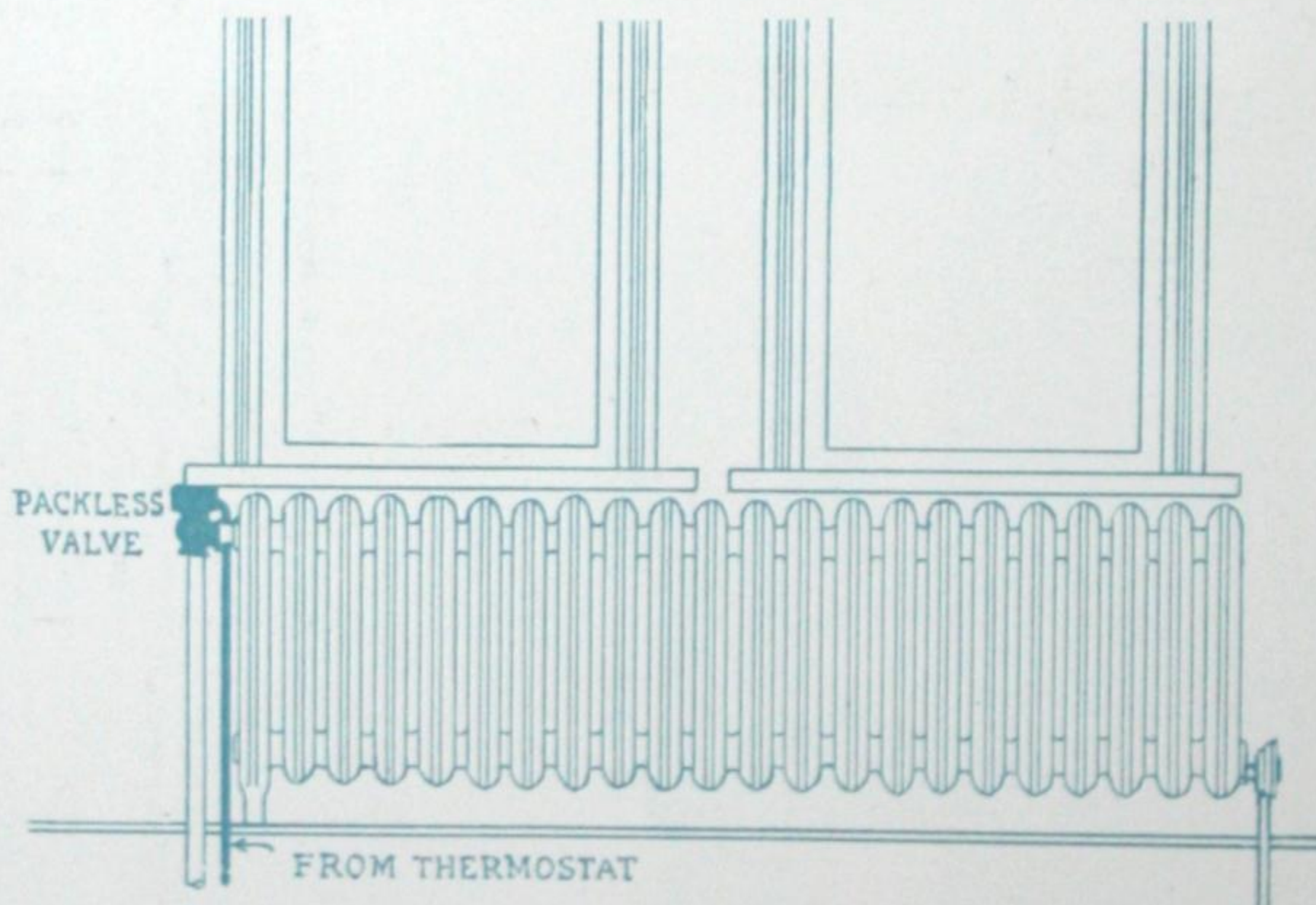


Powers All-Metal Packless
Radiator Valve

(One-fourth actual height)

The valve is extremely low and compact in design, the space normally required by the packing box being saved. Where top feed radiators are placed under windows or where the radiators are enclosed, this saving in height is a great advantage. With the omission of the packing box there is removed all possible chance of leakage. Operating with the modulated pressures afforded by the Powers thermostat, it responds quickly to the smallest change in heat requirements. This packless valve is an exclusive feature of our system for control of vapor steam plants.

Note the smooth surface of this valve, the absence of dirt-catching pockets. Can always be wiped clean with a cloth. Sanitarially correct.



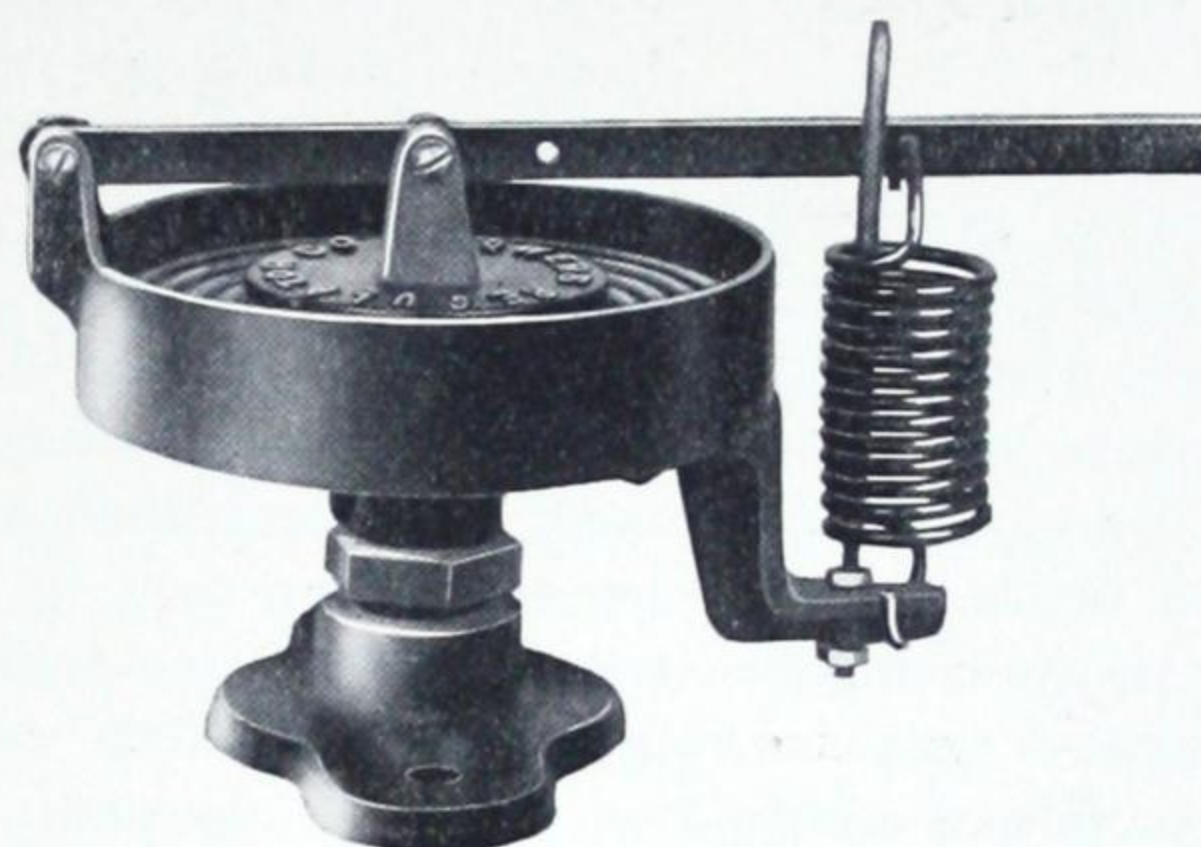
The Powers Packless Valve is Sightly and Saves Valuable Space
when Radiators are Located Under Windows or Enclosed

The Powers Damper Control

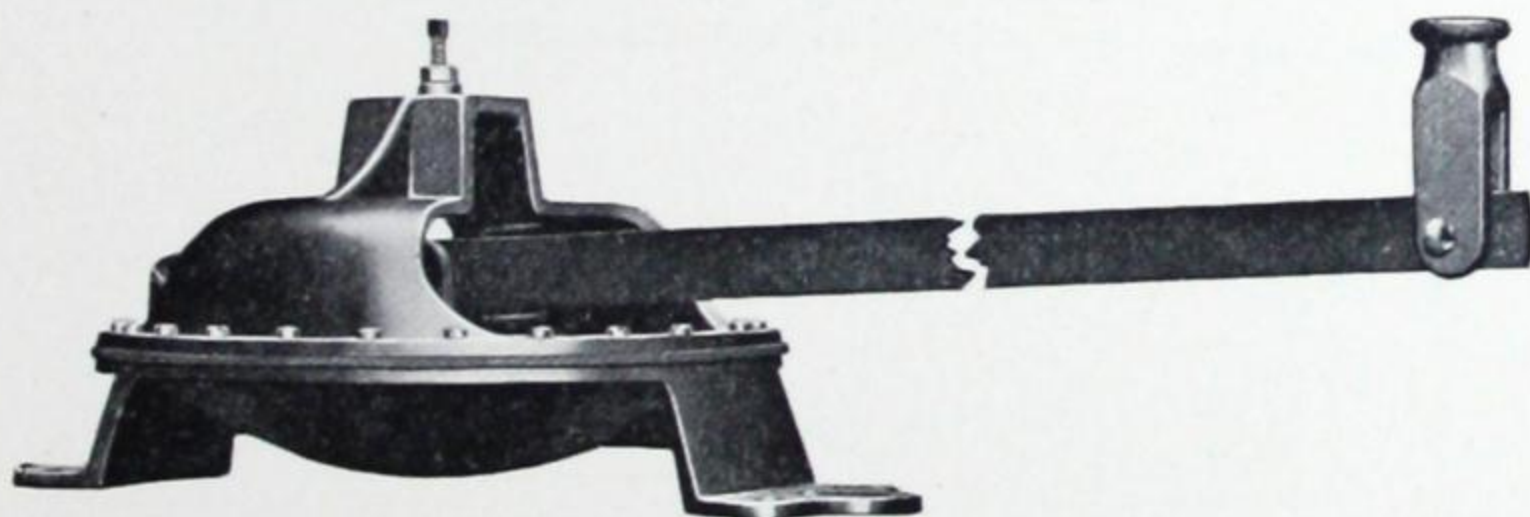
Dampers, whether of the mixing type, or single, if thermostatically operated, should always be controlled gradually. The type of heating system employed makes no difference in this respect. It is here, then, that the great value of the graduated control—obtained exclusively with the Powers Thermostat—is particularly demonstrated especially in the control of mixing dampers that govern the supply of warm air to heated rooms.

It is essential that the damper construction be of the best; blades should be light and rigid, carefully balanced and easily operated. All of these good qualities and more exist in the Powers dampers. They are furnished with blades of galvanized sheet steel mounted in welded wrought iron frames, and are supplied in sizes and shapes necessary to fit conditions.

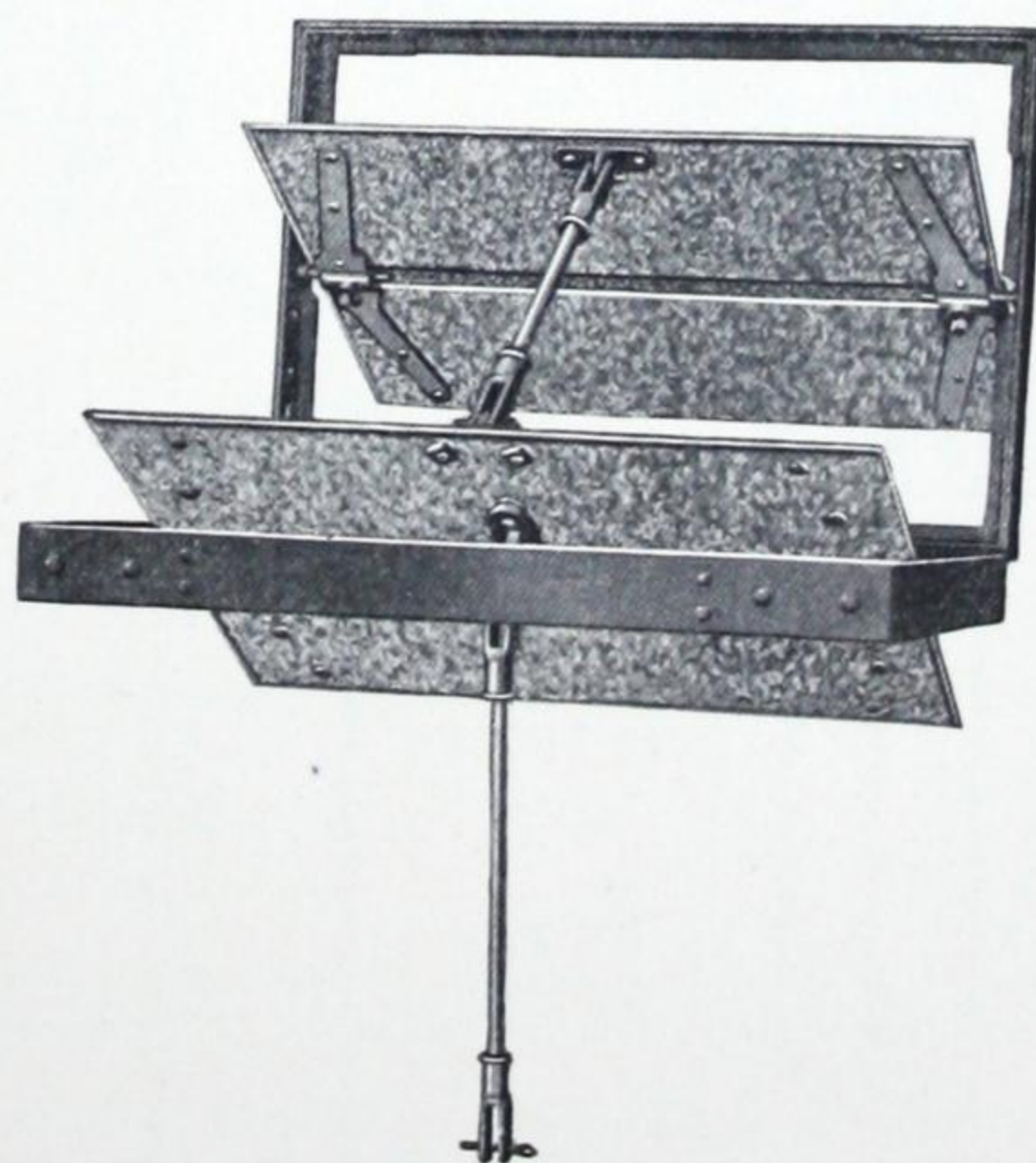
The damper motor used for the operation of the dampers is provided with a sectional bellows similar to that used in the all-metal coil valve. These damper motors are made in several sizes with power sufficient for the operation of the largest dampers. Their construction is such as to make them perfectly responsive to the gradual control afforded by the thermostat.



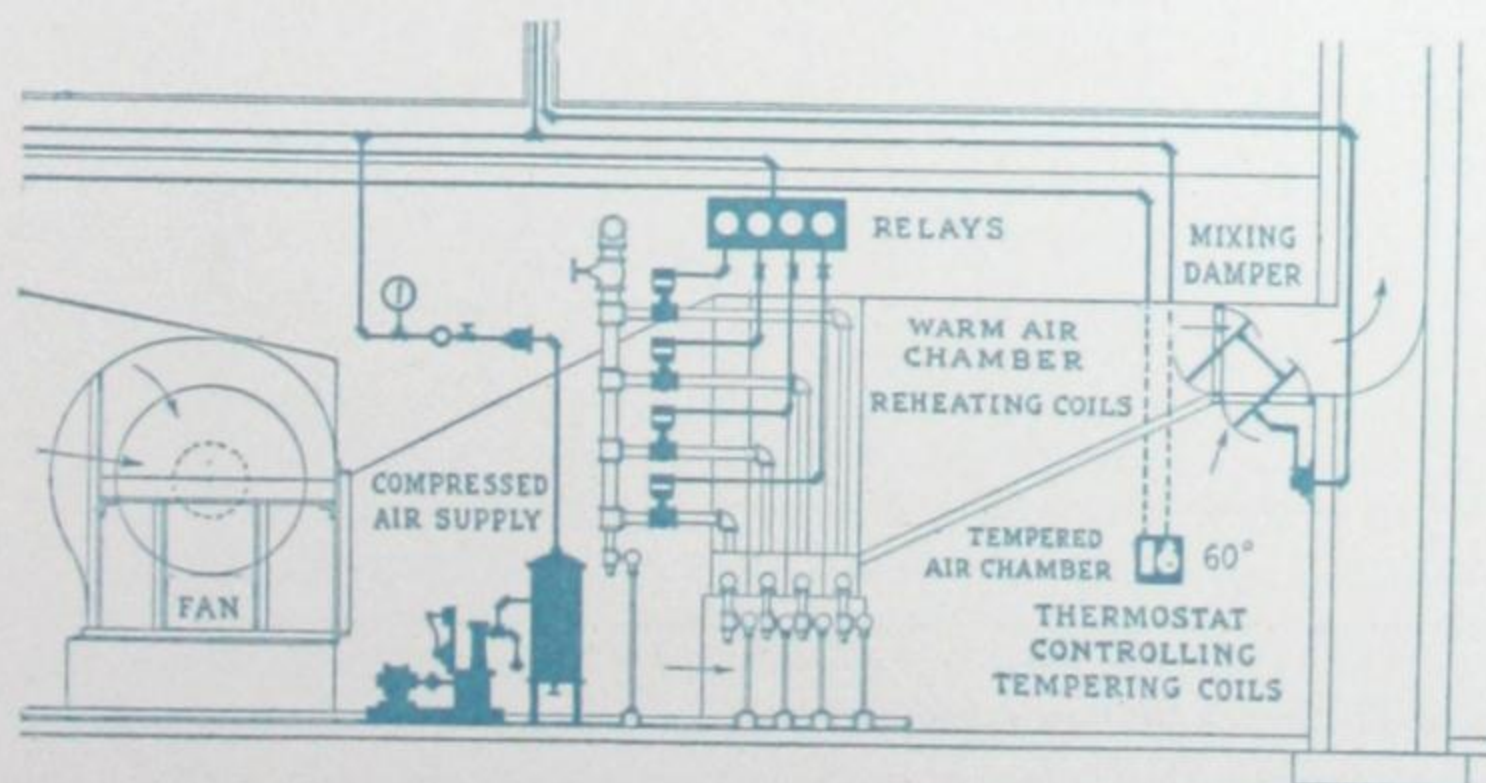
Powers 6-Inch All-Metal Damper Motor



Powers 12-Inch Damper Motor



Powers Mixing Damper



Mixing Damper as Used in Plenum Heating System

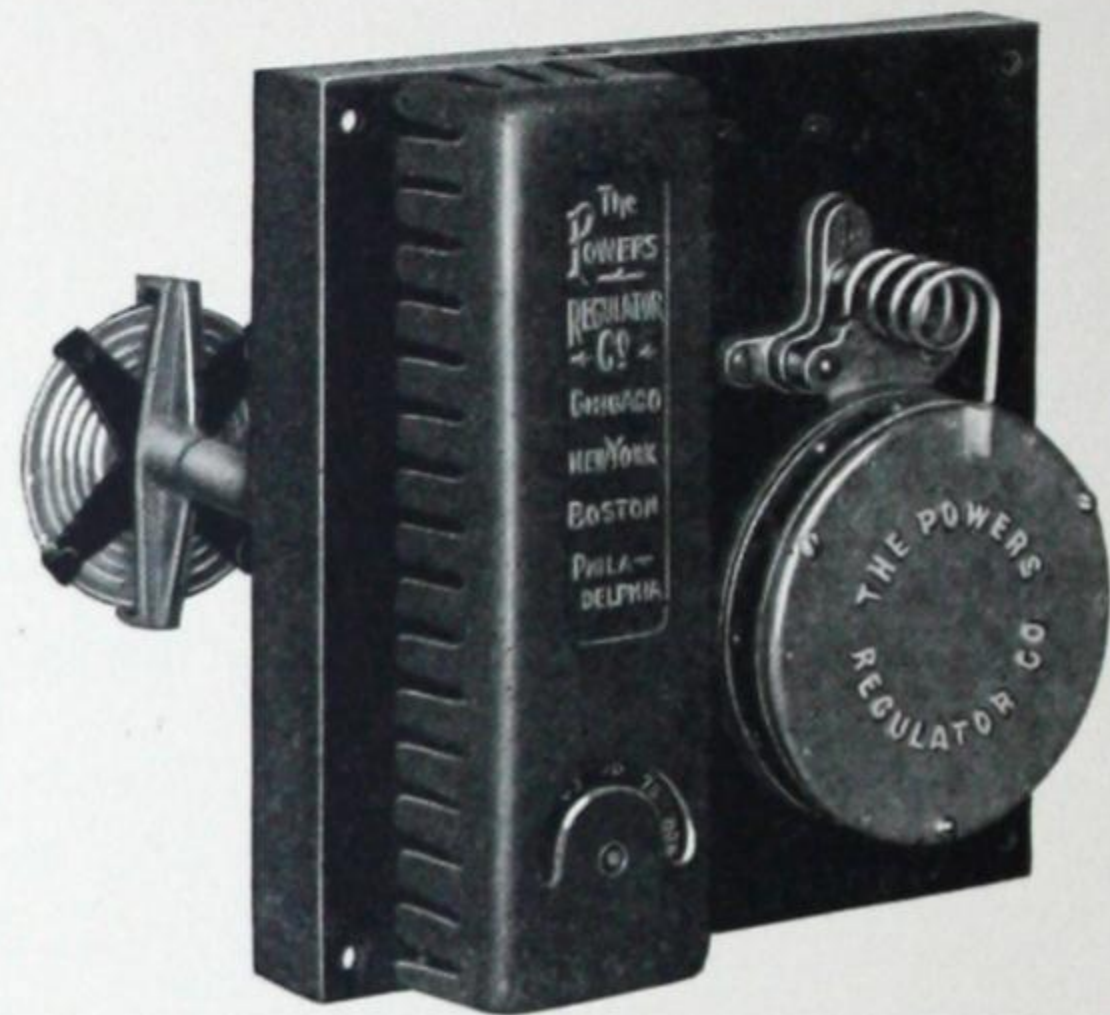
The Powers Relay



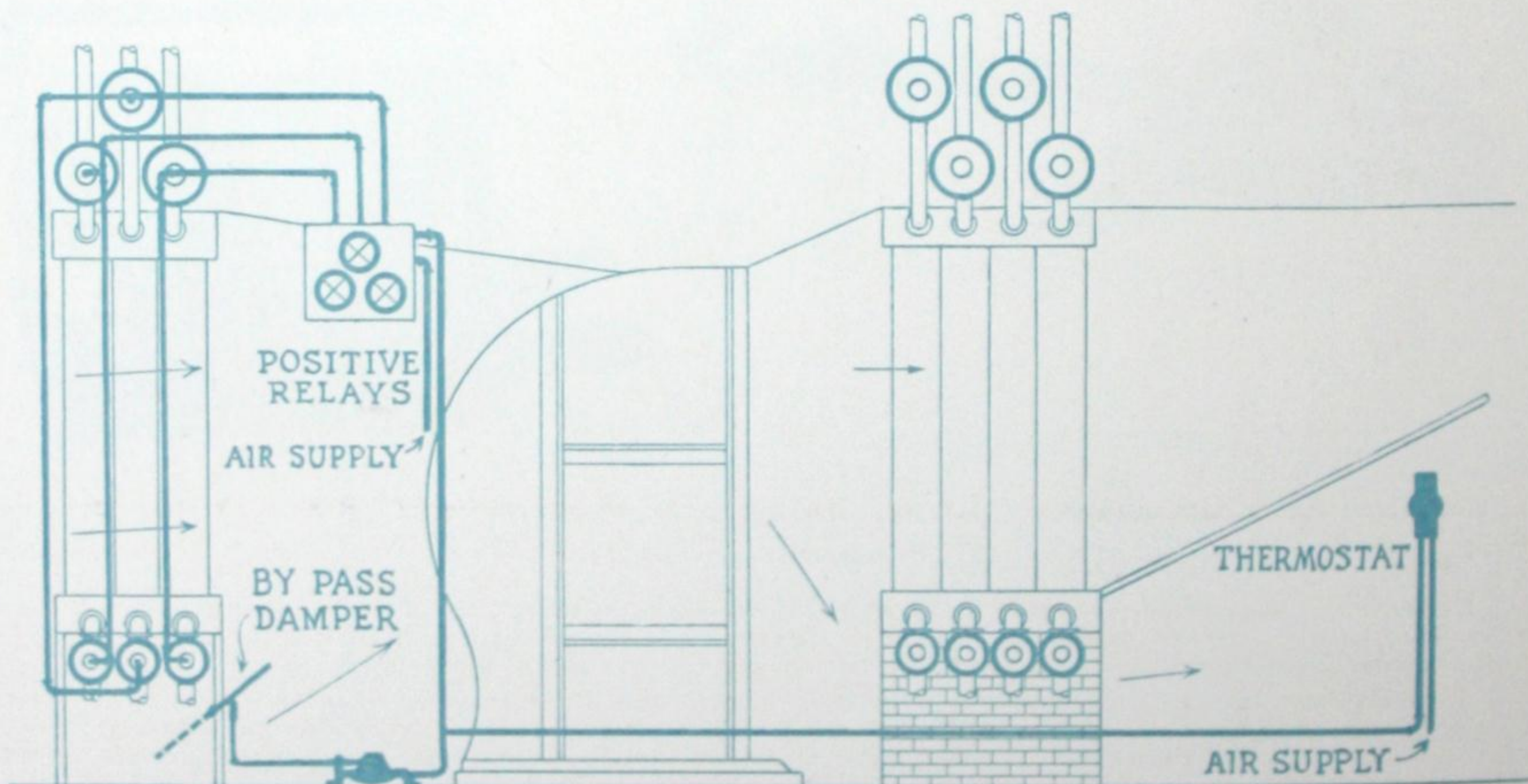
Powers Relay.
Made for Either
Gradual or
Positive Action

THE POWERS RELAY increases enormously the capacity of a single thermostat to control a large number of valves. It does this by introducing an auxiliary supply of compressed air. The gradual relay reproduces faithfully the graduated pressures of the thermostat, and by placing springs of different tensions in the diaphragms of several valves these valves can be made to operate in any desired sequence or relation to each other.

The positive acting relay is used where positive valve action is desired. It converts the gradual action of the thermostat into positive control of the diaphragm valves and affords at the same time a wonderful opportunity for fractional control of the entire heating surface so that the different sections of it are brought into service progressively as the outdoor temperature falls and cut out again one by one as it rises. An unlimited number of these relays may be grouped under one thermostat and the range of that instrument may be spread over the entire temperature scale from zero to 70° as in the control of reheating coils in a plenum chamber, see drawing, page 10. This relay principle of control also furnishes complete immunity from danger of freezing any of the coil sections,—the action is described more fully in the following pages.



Powers Gradual Relay Mounted with a
"K" Duct Thermostat



Powers Thermostatic Control of Preheating Coils, Gravity Circulation, with by-pass damper.
Positive action of coil valves and graduated action of by-pass damper.

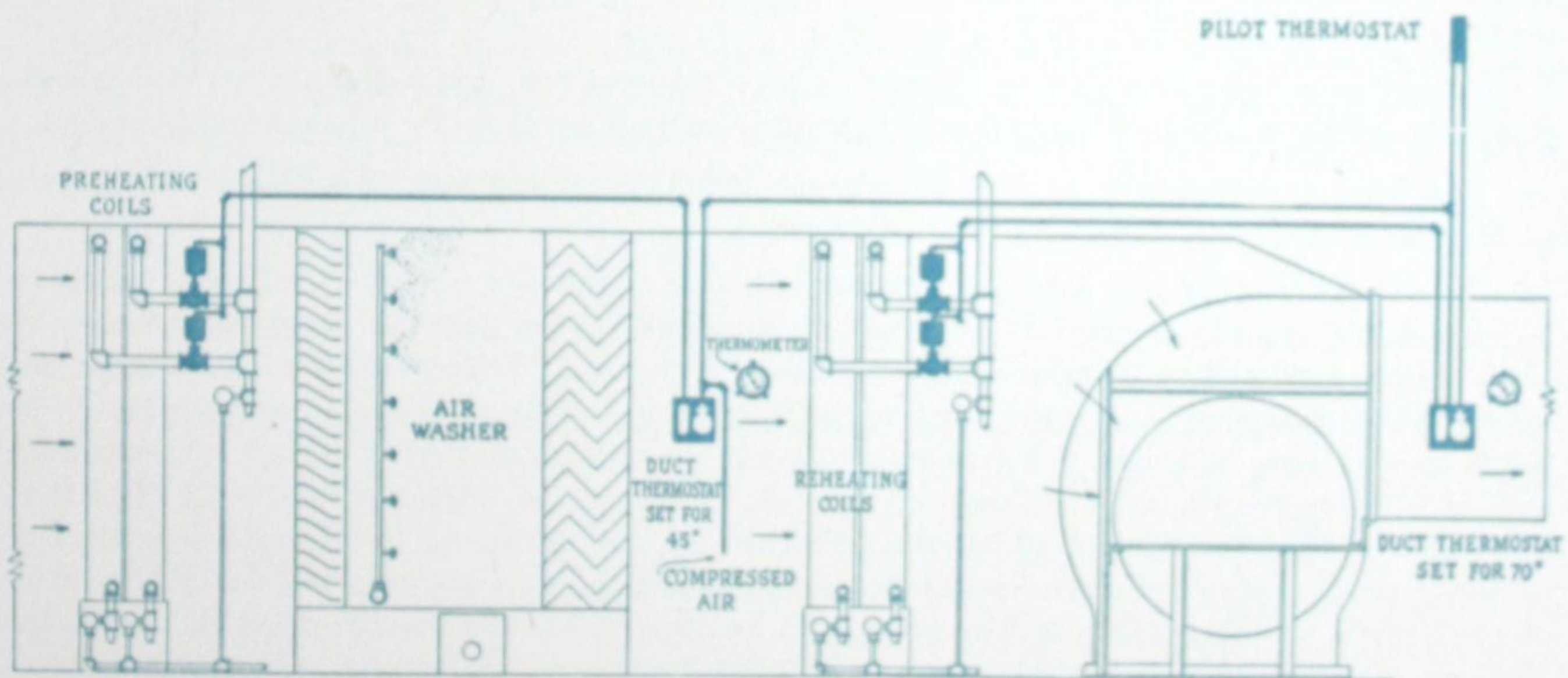
Powers Control of Heating & Ventilating Fan Units

The heating surface employed in the indirect heating and ventilating units is subdivided into several sections to facilitate control, either manual or automatic, and the Powers method of controlling these sections possesses great advantages.

Where the heating coils are provided with a return line vacuum system or similar means for removing the condensation, the supply to each section is equipped with a diaphragm valve and an entire group placed under the control of a single thermostat of the type K duct pattern. This thermostat with its graduated action affords a perfectly graduated control of the valves and by employing differential compression springs in the diaphragm tops of these valves the several sections are controlled in sequence, or progressively, instead of all at once. The diaphragm valve controlling the first section—this being the one which the cold air first encounters—affords the greatest resistance to the closing action of the thermostat and therefore closes last.

The second or middle section closes slightly ahead of it and the third or inside section, having the diaphragm valve that offers the least resistance to the thermostat control, closes first. In opening, these valves follow each other in reversed order—that on the outside or first section opening first, the second following and the third opening last.

It must follow therefore that the first heat required to maintain the specified temperature will be furnished by the outside section of heating coils and that this will be brought into



*Ventilating System with Air Washer and Pilot
Thermostat Control.*

By control of the preheating coils a temperature of 45° is maintained in the air washer chamber when the air is in a practically saturated condition, so that when afterwards it is raised by the reheating coils to a 70° temperature, the moisture content becomes reduced to a practical percentage—about 45 per cent.

The duct thermostat in fan discharge is shown under control of a pilot thermostat in the room so that reheating coils may work to their full capacity until the room is up to 70° , after which the duct thermostat assumes control and maintains 70° in fan discharge. This allows the ventilating unit to automatically reinforce the direct radiation during severe weather and in the first warming up of the room.

This method is particularly useful in treatment of theatres and assembly rooms—where quick initial heating is desired with automatic change to ventilation only when desired room temperature has been obtained.

Powers Control of Heating & Ventilating Fan Units

service long before the outdoor temperature falls anywhere near the freezing point. Even in the control of the preheating coils for air washers where a 40° temperature may be maintained in the eliminator chamber, the thermostat calls for heat at 40° and the outside section must then be brought into service. As the outdoor temperature continues to fall, until the first section of coil can no longer maintain the temperature for which the thermostat is set, the additional sections are brought into service in the order previously described until, if the weather be severe enough, all valves will be opened wide. Reversely, as the weather moderates, the inside section is first shut off, the middle section follows, and only when the temperature is well above the freezing point does the valve on the outside section finally close. Such application of the Powers Gradual Control to tempering and heating coils makes the use of a bypass damper entirely unnecessary.

This method which we have described at some length is obviously different from any method employing positive control by which each section is alternately cut in and out of service as the thermostats controlling it function. In such systems intensely cold air striking the outside section with the steam off will condense the steam remaining in the section so rapidly as to form a vacuum within the section that will prevent the condensation from draining out, consequently, freezing and damage to the coils is likely to occur.

As a result of experience with positive control of ventilating coils, many engineers specify that the first, or outside section, shall be equipped with hand valves instead of automatic control, thus placing the responsibility on the engineer, or care-taker, who is expected to open the valves on this section before the weather gets to the freezing point, and leave them open. Of course he forgets to shut them off when the weather gets mild and as a result the building is overheated.

Those employing the Powers System of Coil Control may extend the control to all sections of heating coil with the assurance that they will all be properly and safely controlled.

We have an experience of over 25 years in this type of coil control without a single case of freezing in any way attributable to our service.

For those heating and ventilating units where the coils are not provided with means for automatically removing the condensation it is customary to provide diaphragm valves on both supply and return of each section of heating surface. These valves must in such case be operated positively, i.e., wide open or entirely closed without intermediate position. We apply in this case, however, the Powers method of control above described but with the addition of positive relays. One of these relays is provided for each section of coil and all of them are placed under the control of the duct thermostat and arranged to respond progressively to the gradual control afforded by that instrument. Thus, the relay responsible for the action of the valves on the outside or first section of heating coil is the first to open its valves and the last to close them. The other relays function in their turn as the heat requirements exceed the capacity of the first section. Once a relay has opened its valves, however, they remain open so long as its section of coil is required to maintain the specified temperature; thus the outside section is always open and in service before a freezing temperature is reached outdoors and cannot shut off while the freezing temperature exists.

To bridge over the inequalities due to the positive control of these individual sections it is customary to employ a by-pass damper which is operated gradually by being connected with the line leading from the thermostat to the relays. See drawing page 16.

In the foregoing illustrations we have assumed that the heating surface be divided into three sections, which is quite customary. There is no limit, however, to the number of sec-

Powers Control of Heating & Ventilating Fan Units

tions which may be employed, the system being elastic enough to cover as many divisions as may be made in the heating surface. In the system first described where there are a number of sections or the valves are large, we customarily employ what we term a "gradual relay" with the duct thermostat. This relay reproduces perfectly the graduated action of the thermostat but with the augmented volume of compressed air necessary to the sensitive operation of so many valve diaphragms.

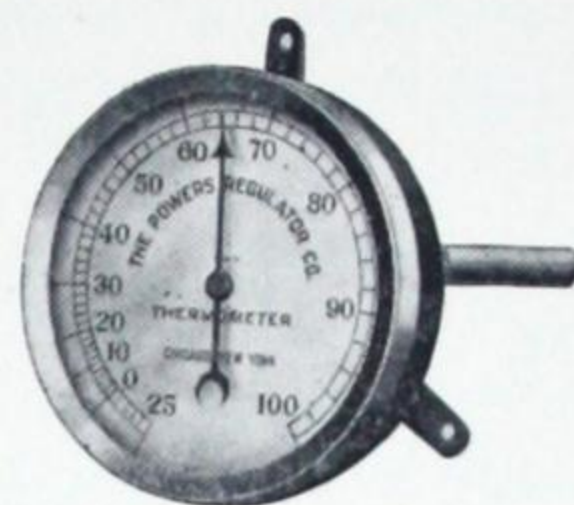
BY-PASS DAMPER CONTROL

The installation of a by-pass damper under tempering or pre-heating coils is frequent practice and where this damper is controlled by a thermostat located in the tempered air duct a very fair degree of regulation can be obtained.

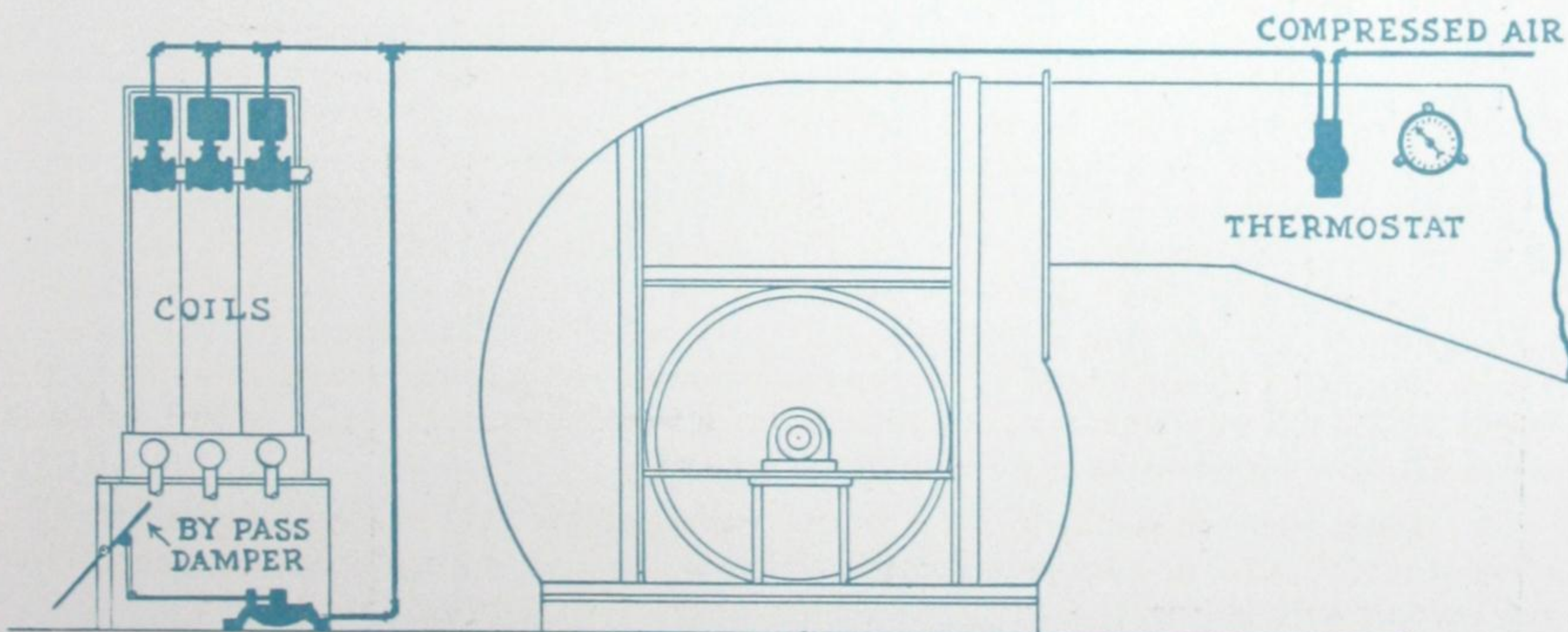
Where more exact results are desired the coil sections should be equipped with diaphragm valves controlled by the same thermostat, and by means of varying spring tensions in valve diaphragms and damper motors a degree of flexibility is obtained whereby the by-pass damper and the valves operate with any desired relation to each other.

As an example the by-pass damper opens first and if in the wide open position there is a tendency for tempered air to rise above the desired point, the thermostat will then successively shut off the heat supply to the coils.

If the type of heating system is such that coil control requires valves on both supplies and returns (see drawing page 16), we secure the same result by the use of positive relays operated by the tempered air thermostat, so that both supply and return valves are operated positively and the by-pass damper gradually.



Powers Duct Thermometer



Powers By-Pass Damper Control Showing Thermostat Giving Graduated Control to Coil Valves and By-Pass Damper.

Powers Control of Unit Ventilating Systems

In the direct-indirect or unit systems of ventilating each room is provided with what is practically an individual heating and ventilating plant. Air for ventilation is heated by means of enclosed radiators. These radiators are placed in the rooms, the fresh air being admitted through wall openings back of the radiators. Small electric-driven blower units may be used to create forced air circulation or draft may be induced by heated vent flues. Besides these indirect ventilating units, direct radiators are usually provided to take care of the heat requirements of the rooms.

Because of the large number of individual units to be cared for—one or more in each room—automatic control is more essential here than with any other system of heating in common use. The control, however, must be virtually trouble-proof. The number of units—their location in the rooms—makes supervision both expensive and impracticable.

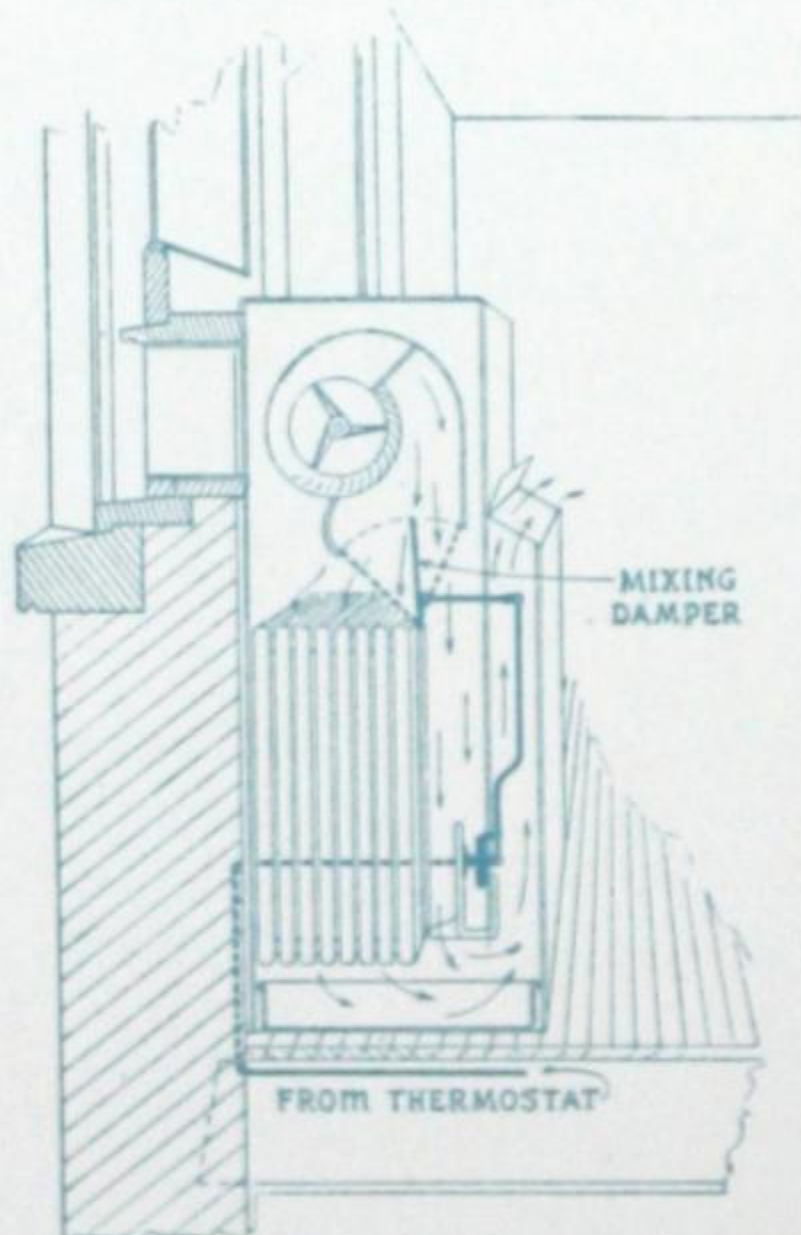
The gradual action of the Powers Thermostat is necessary in controlling these systems, particularly for the units heating the ventilating air. As the ventilation is required at a fairly constant rate, it follows that the radiator heating the fresh air must be kept continuously in operation and at an even heat to prevent the delivery of alternate hot and cold currents of air. It should be borne in mind that the cooler air will always fall to the floor, creating uncomfortable and unhealthful drafts.

An added advantage in Powers gradual control is found where direct radiators are employed in addition to the ventilating units. These radiators are provided with diaphragm valves that have springs offering less resistance so that in operation they close ahead of those controlling the ventilating units. This keeps the ventilating units in full operation as long as heat is required, thus insuring a constant supply of fresh air without cold drafts.

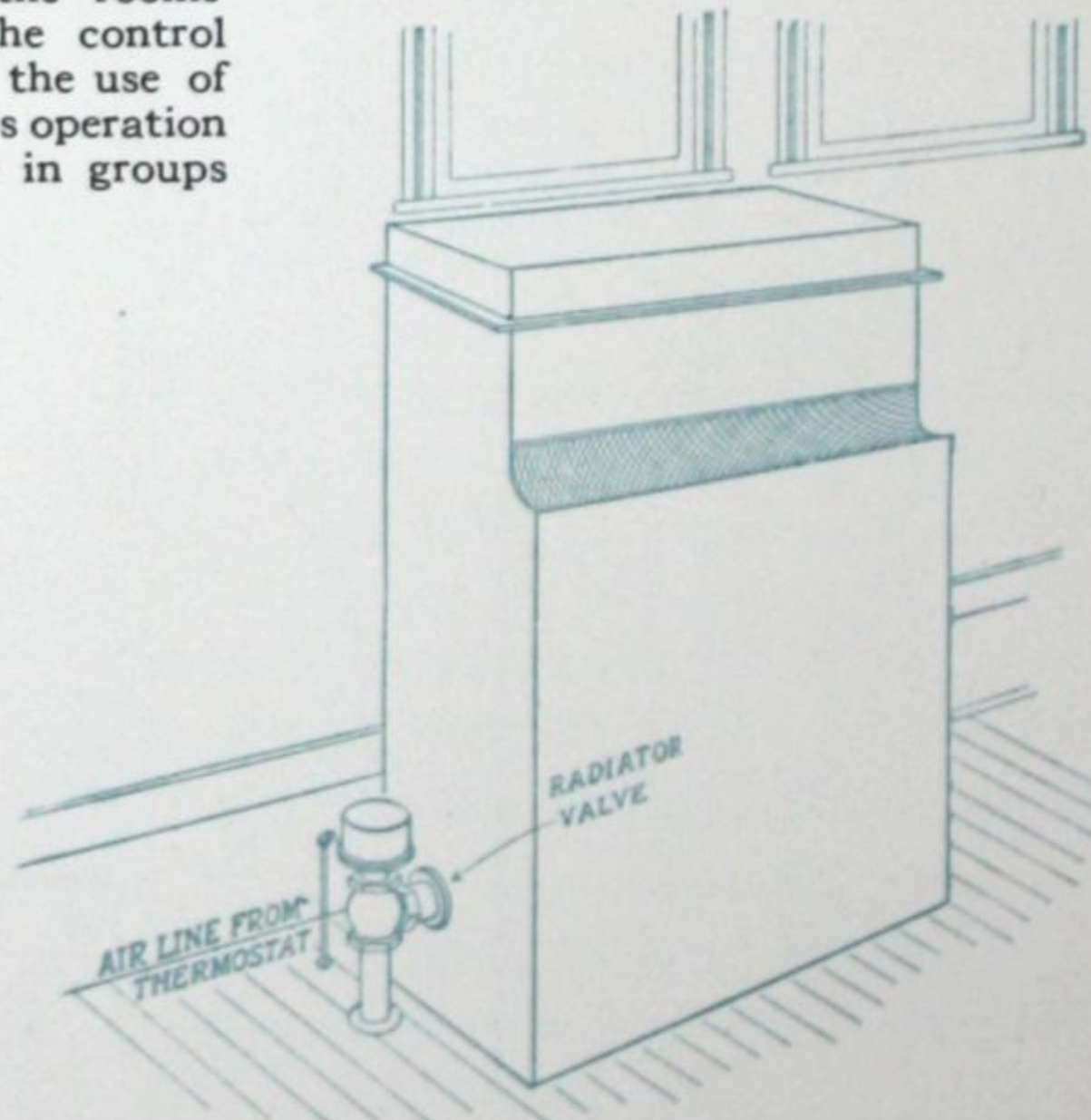
NOTE.—The drawings below show the application of the Powers apparatus to a damper-controlled and a valve-controlled unit system. If desired, Powers Control can be applied to both the Valve and the Mixing Damper. Where the type of heating system requires it, the Powers Compound Thermostat can be used to give positive control to the radiator valve at the same time it operates the mixing damper with the graduated motion.

The Powers System of Pneumatic Switch Control is frequently used for the operation of fresh air intake and recirculating dampers on these unit heaters so that they may be operated from one or more points in the building.

The dampers in all of the rooms may be placed under the control of a single switch or by the use of a number of switches, this operation can be applied to rooms in groups or individually.



Unit Heater Controlled by Mixing Damper Operated by Powers Damper Motor



Unit Heater Controlled by Diaphragm Valve on Steam Supply to Radiator

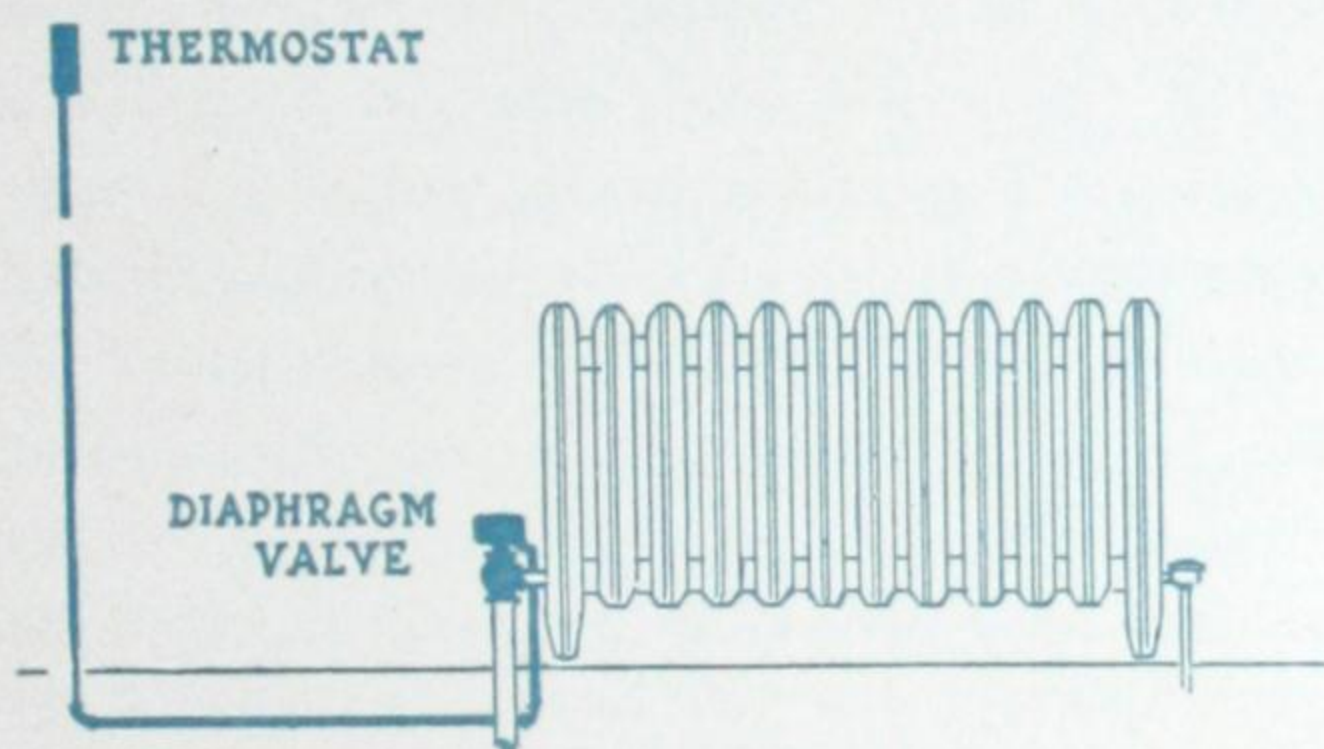
Powers Temperature Control Systems in Residences

While the same advantages of fuel economy and hygienic value hold good in residence work, these gains are largely overshadowed by the comfort factor which is of such great importance in the home.

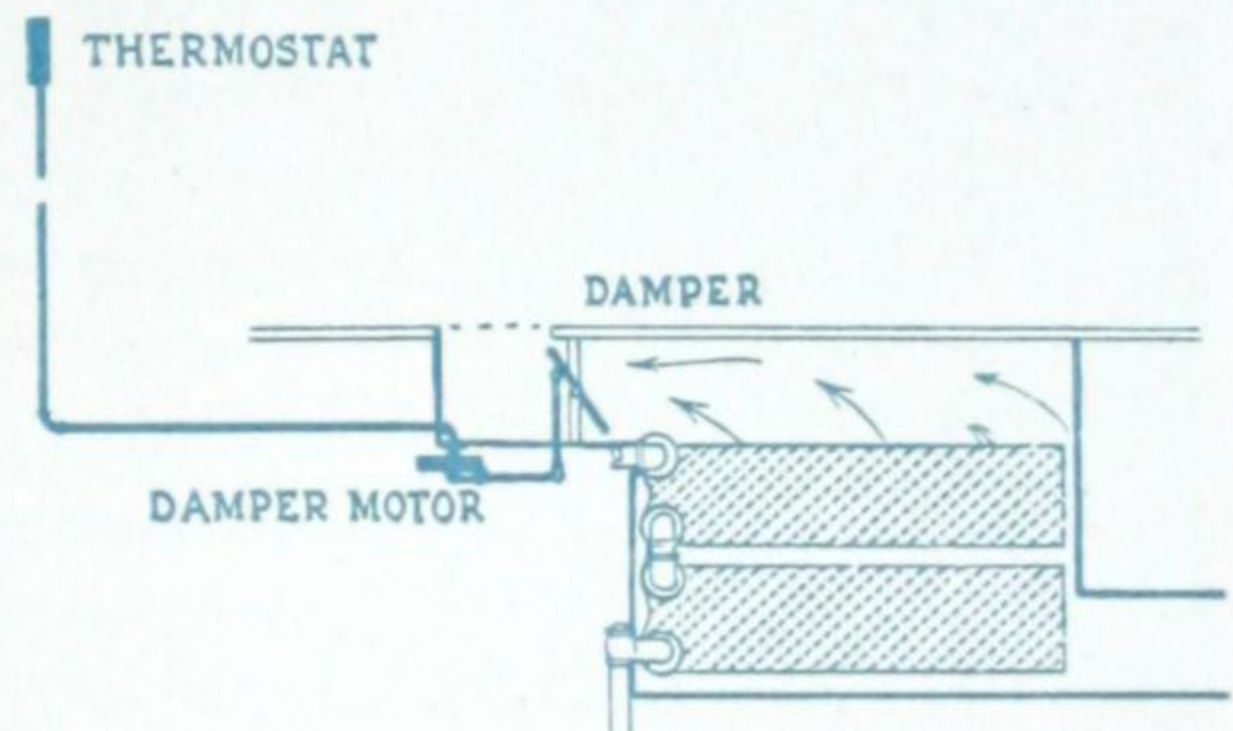
With automatic temperature control the entire heating subject is banished to the basement where it becomes a greatly simplified matter of maintaining a fire—living room temperatures are uniformly right day and night, sleeping rooms cold at will, but always under control when warmed. These are things the value of which cannot be reckoned in money.

The reliability of the Powers System is unusually important in residence work. No one wants the disturbance and annoyance of workmen constantly running through the house making repairs and adjustments. The thermostats must operate consistently and continuously,—they must be more than automatic—infallible.

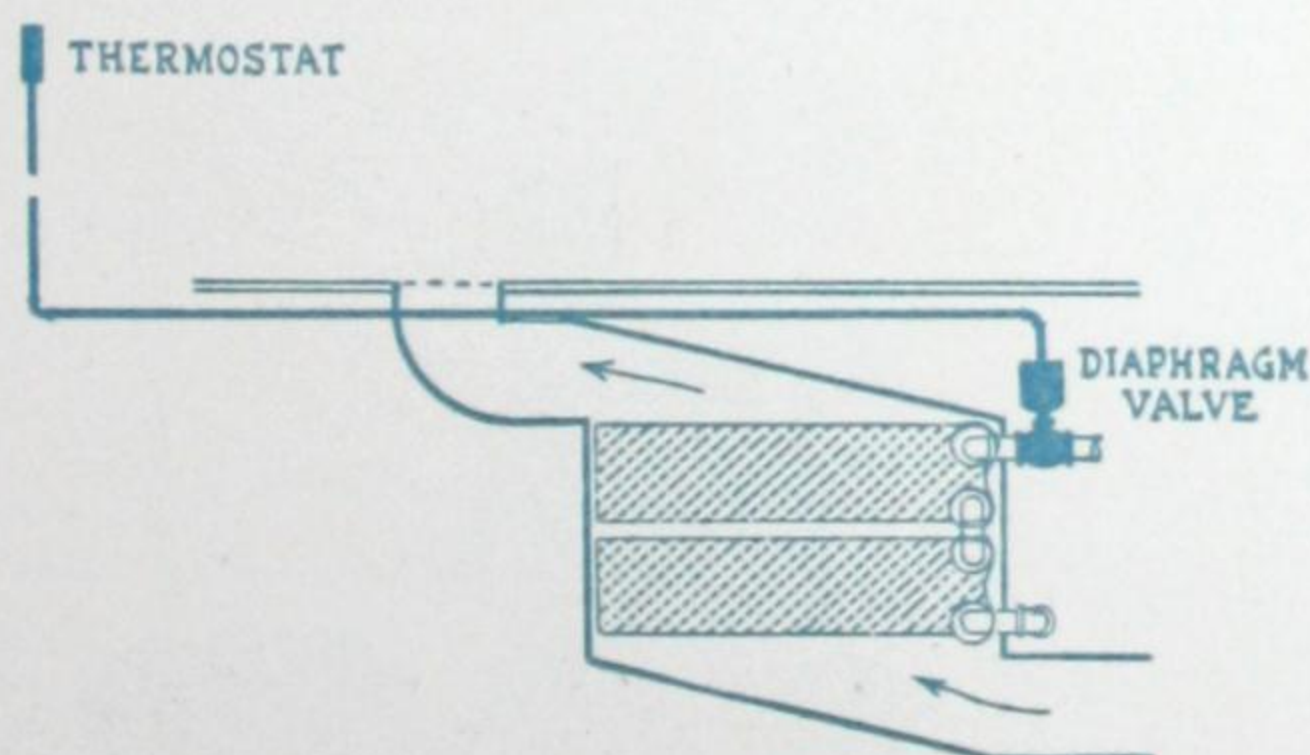
Below is shown in simple diagrammatic form several methods by which Powers Control is applied to individual rooms heated by direct and indirect radiators.



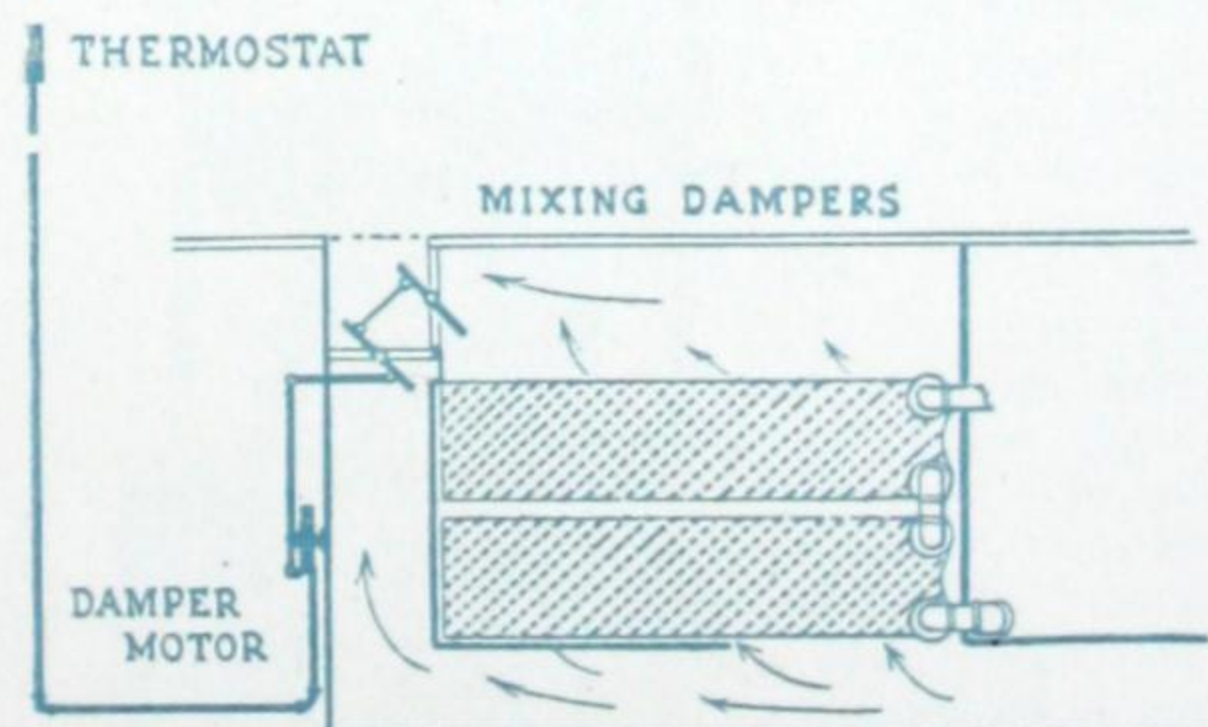
A. Direct Radiator Controlled by Diaphragm Valve on Steam Supply.



B. Control of Single Damper on Indirect Radiator. Damper operates gradually checking supply of warm air to meet requirements of the room.



C. Indirect Radiator Controlled by gradually operating Diaphragm Valve on Steam Supply.



D. Control of Indirect Radiator by Graduated Operation of Mixing Dampers.

CONTROL OF MAIN FRESH AIR DUCT

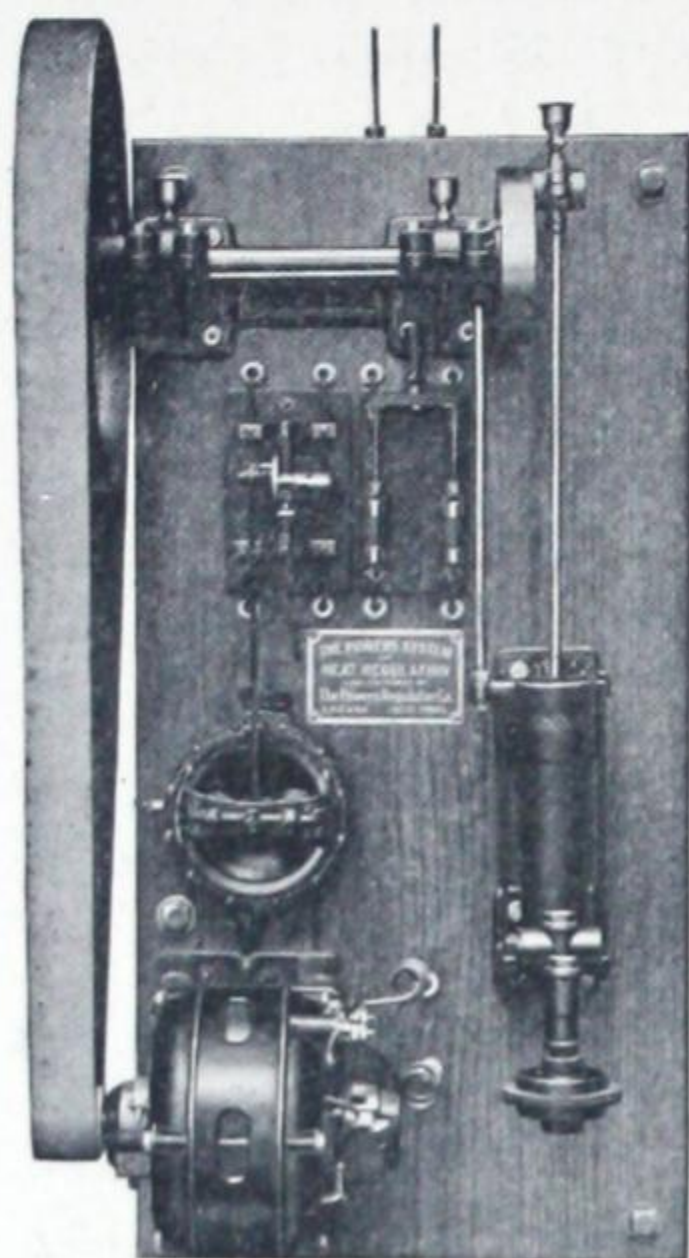
The fresh air supplied to the indirect radiators in a residence is usually brought from out of doors through one or more main ducts. In the intake to these main ducts dampers are placed and operated by a thermostat inserted in the heating main where it leaves the boiler, and so arranged that, should the heat supply at any time fail, these dampers will close and prevent the entrance of cold air into the house.

Powers Air Compressors

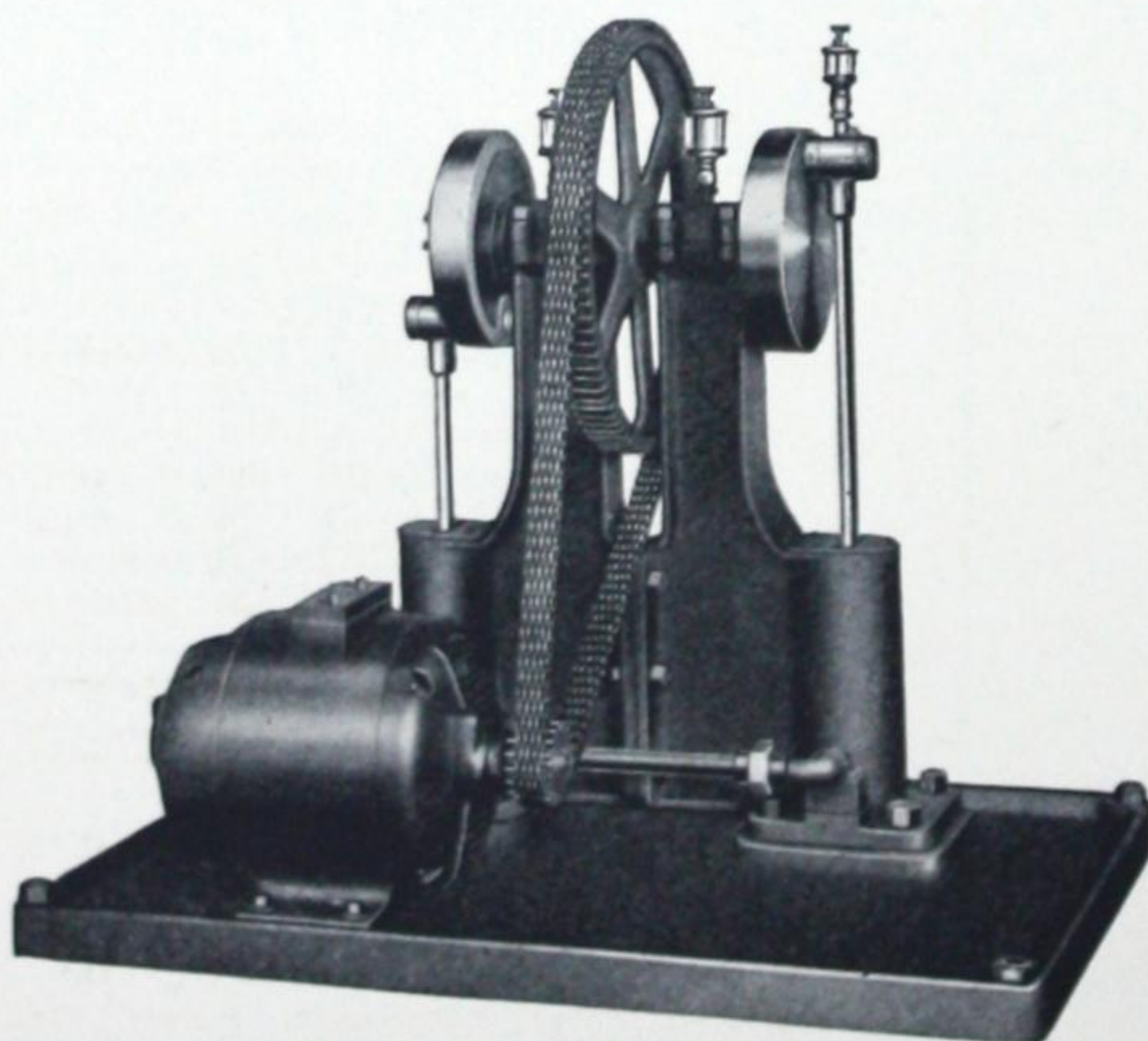
A good air compressor is vital to a perfect system of temperature control. To insure design, materials, and construction best suited to this class of work, we build our own compressors. Equipped with our special governor, these compressors are entirely automatic, only requiring oil replenishment once each season. They are silent in operation and entirely self-lubricating. The cylinders are accurately bored and fitted with metal pistons and leak-proof rings. Bearings are of bronze. The entire design and construction has been developed to give trouble-proof durability, and with the small air requirement of the Powers system, these compressors are practically everlasting.

Electric Compressors for alternating current are fitted with high grade motors of the repulsion type, and can be operated from the lighting circuit with a negligible consumption of current—D. C. Motors for direct current of course.

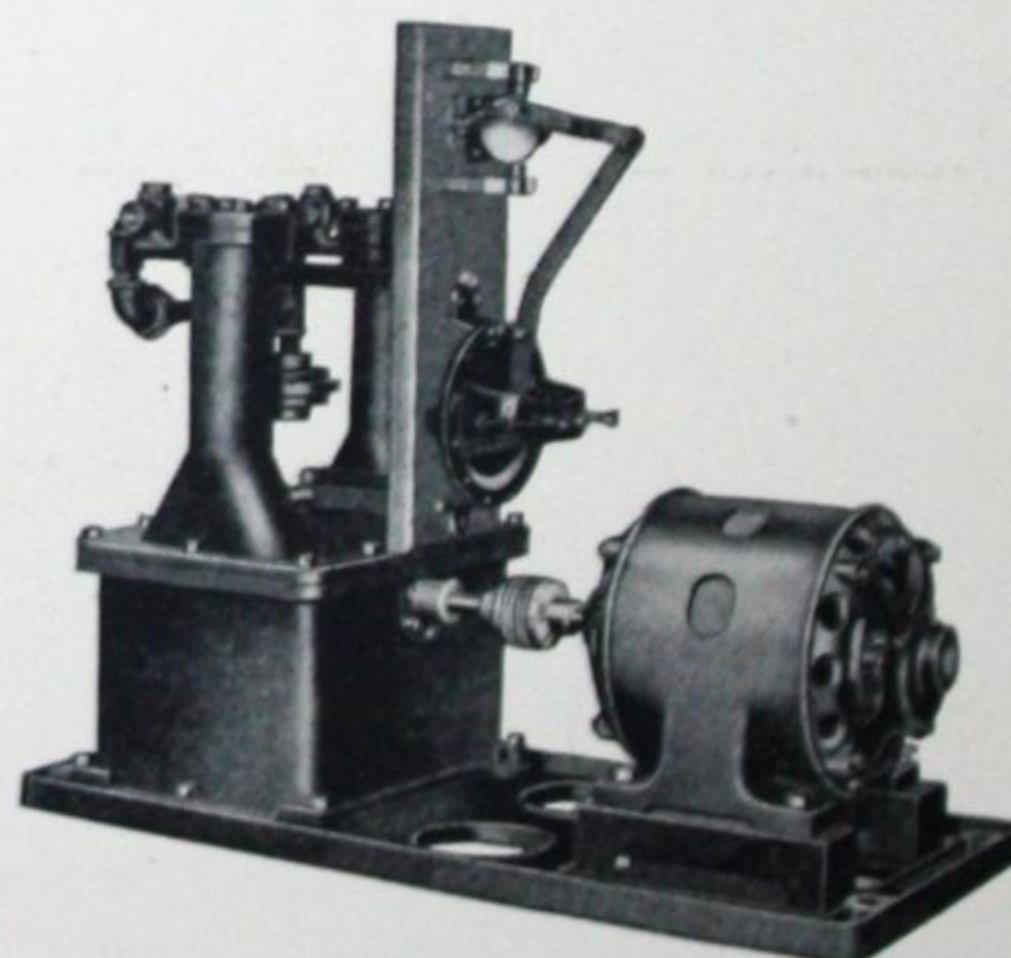
Where electric current is not available, the water driven compressor may be used. It is thoroughly efficient, durable and automatic in its operation. For automatic control of fan ventilating units we make a simple belt drive compressor to be operated from a pulley on the fan shaft. Automatic steam driven air compressors can also be furnished for use in connection with plants maintaining steam driven units. Our entire line of air compressors is shown and fully described in our special Bulletin No. 128.



Powers Belt Driven Electric Compressor



Powers Motor Driven Compressor Heavy Duty Type with Silent Chain Drive



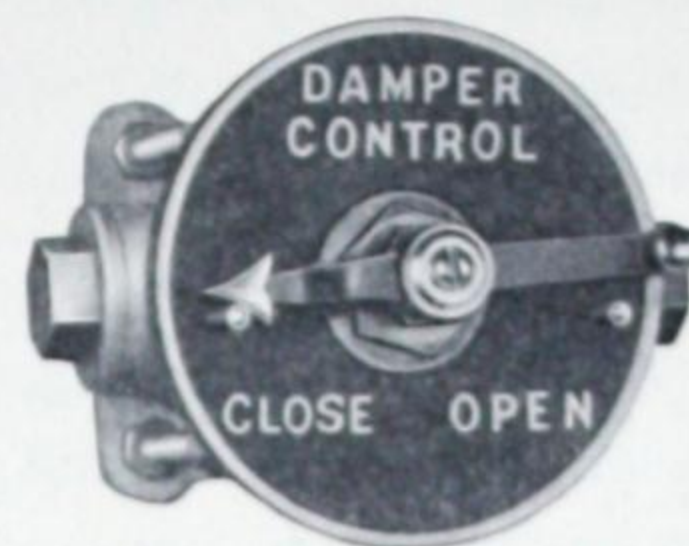
Powers Motor Driven Compressor, Direct Connected, Worm Gear Drive

Powers Pneumatic Switch for Remote Control

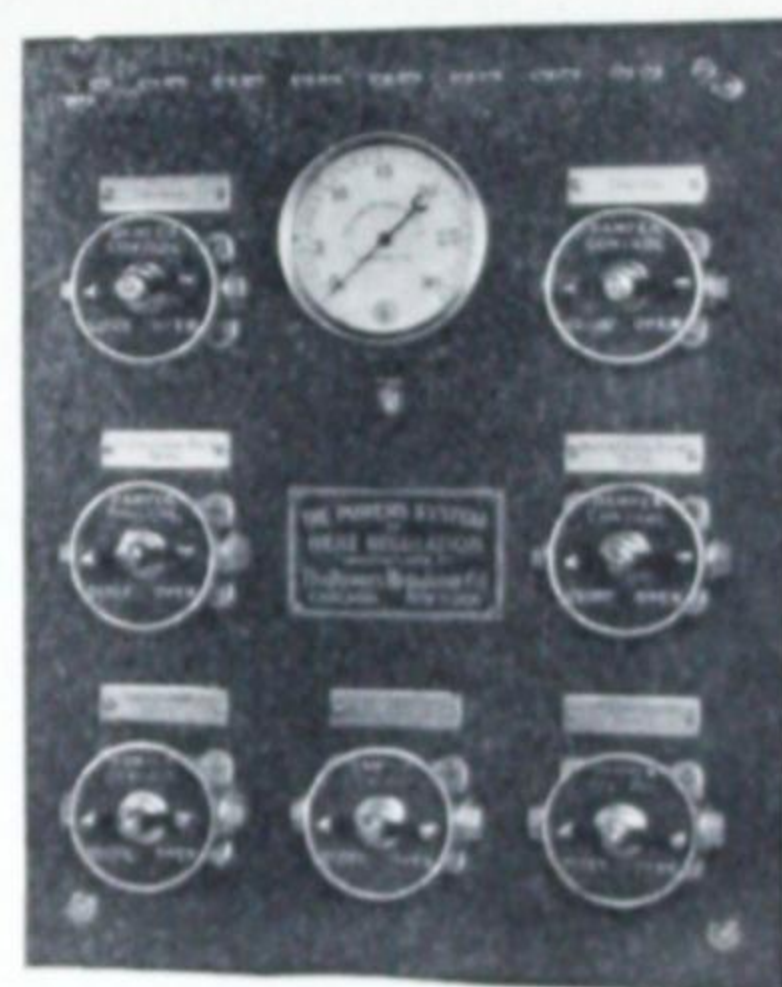
The control by means of compressed air of inaccessible dampers and valves is a most desirable adjunct to a system of automatic heat regulation, and is generally included as a part of the heat regulation contract.

A ventilating system frequently comprises means of bringing in fresh air, exhausting used air, and also ducts and equipment which permit of recirculating the air within the building under certain conditions. This calls for large dampers—usually of the louvre type—controlling the fresh air intake, foul air exhaust and recirculating ducts, and these dampers may be of varying sizes and very distant from each other. By the use of the Powers Pneumatic Switch the entire operation of these dampers can be localized on a switch-board placed conveniently in the heater room. Compressed air is piped to the switch-board and from that point to the several dampers which are operated by damper motors such as previously described. A similar arrangement may be used for directing heat and ventilation to certain portions of the building, such as the auditorium shown below. Again, in large buildings each heat riser may be equipped with a diaphragm valve and placed under control of a central switch-board, enabling the engineer to cut off the heat from different parts of the building at will.

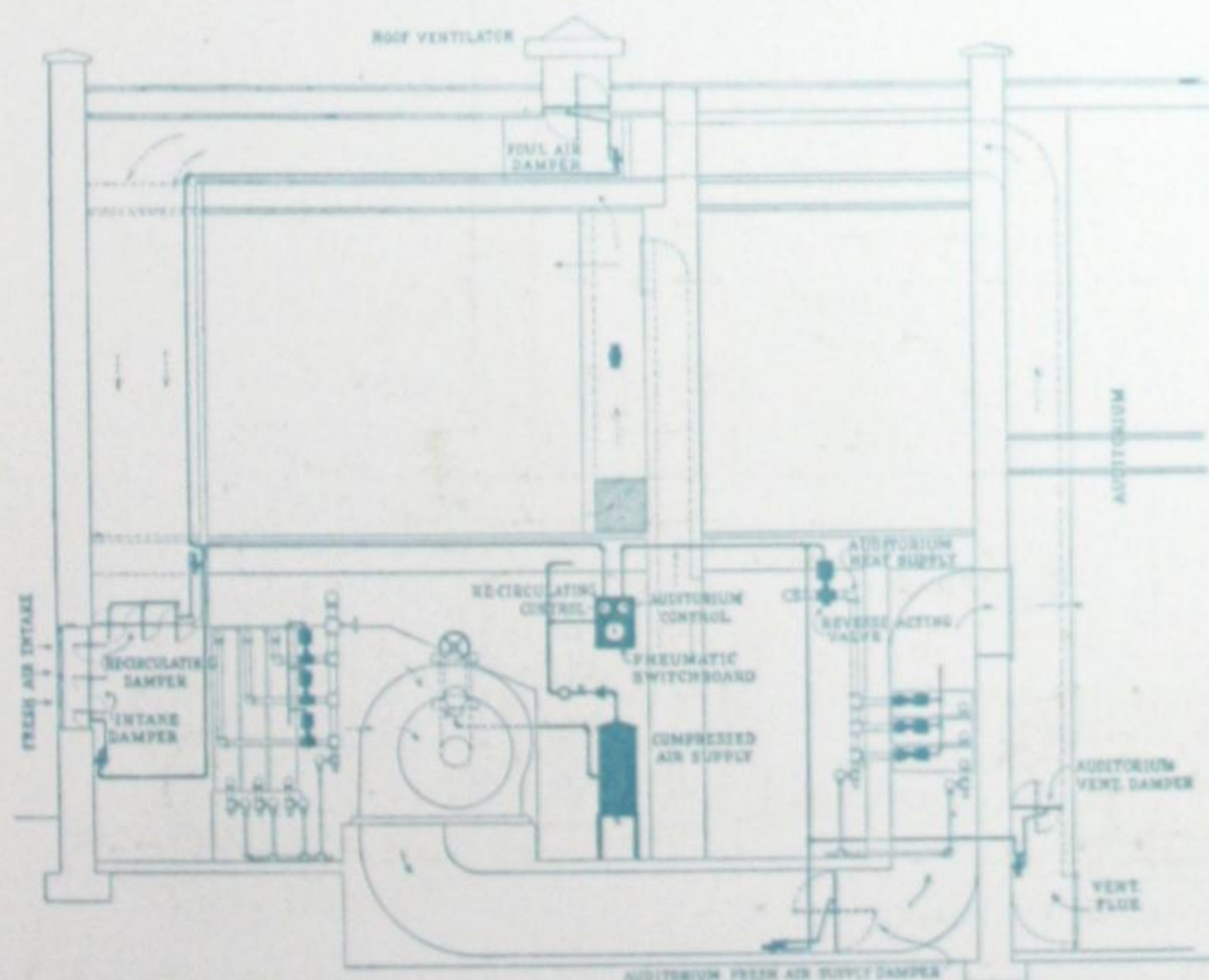
The Powers Pneumatic Switch is of very sturdy construction and can be relied upon to remain tight and to function indefinitely. The switch-boards used with a group of these switches are usually of slate and exposed fittings, name-plates, etc., may be of polished nickel or brass.



Powers Pneumatic Switch



A Powers Pneumatic Switch Control Board



Typical Application of Powers Pneumatic Switch Control

By the use of Powers Pneumatic Switch Control the one switch marked Recirculating Control simultaneously closes the fresh air intake and roof vent and opens the recirculating damper so that quick heating is facilitated—or this operation may be reversed when fresh air and ventilation is desired. A similar operation of the Auditorium Control Switch opens or closes the diaphragm valve which controls the auditorium heating unit and the dampers in the auditorium fresh air duct and ventilating flue. It would obviously be a very difficult and expensive task to secure this operation without the pneumatic control.

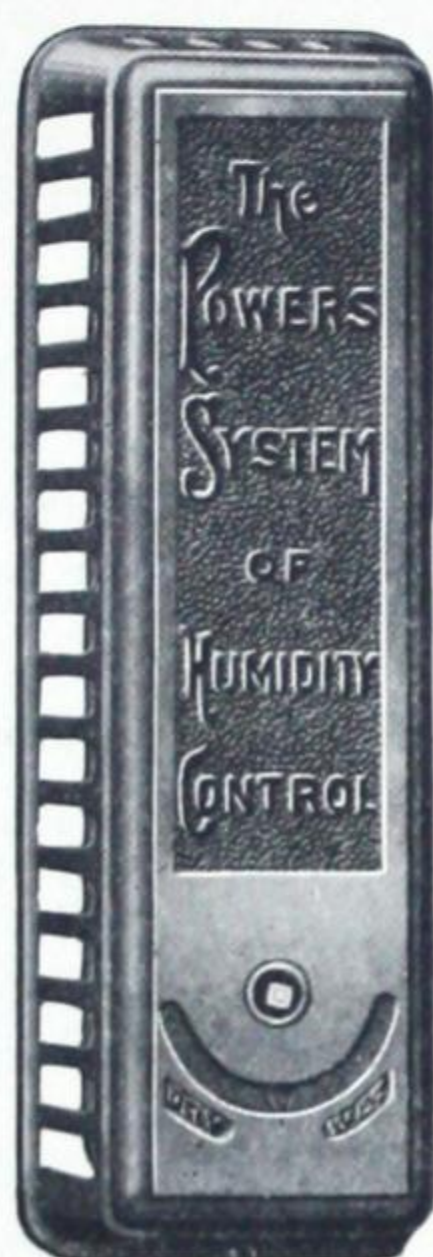
Equipment of this kind is arranged so that the air pressure opens the fresh air intake, vent damper, steam valve, etc., while the release of the air pressure reverses these movements. Should the air supply fail through interruption of power or similar cause, the system automatically closes these dampers and valves.

The Powers System of Humidity Control

The moisture carrying capacity of air increases rapidly with its rising temperature. A quantity of moisture which will completely saturate air at zero, gives less than six per cent saturation at 70 degrees. This is a lower degree of humidity than is found in the world's driest deserts, yet it is the condition that results from the heating and delivery to rooms of winter air without the addition of moisture.

This excessive dryness of the air in the average room during the heating season is far-reaching in its unhealthful effect on the occupants. Especially is this true in the schoolroom, where the occupants are growing and their powers of resistance are not well developed. Throat disorders, colds, nervousness, and dullness are traceable largely to this cause. The air, with

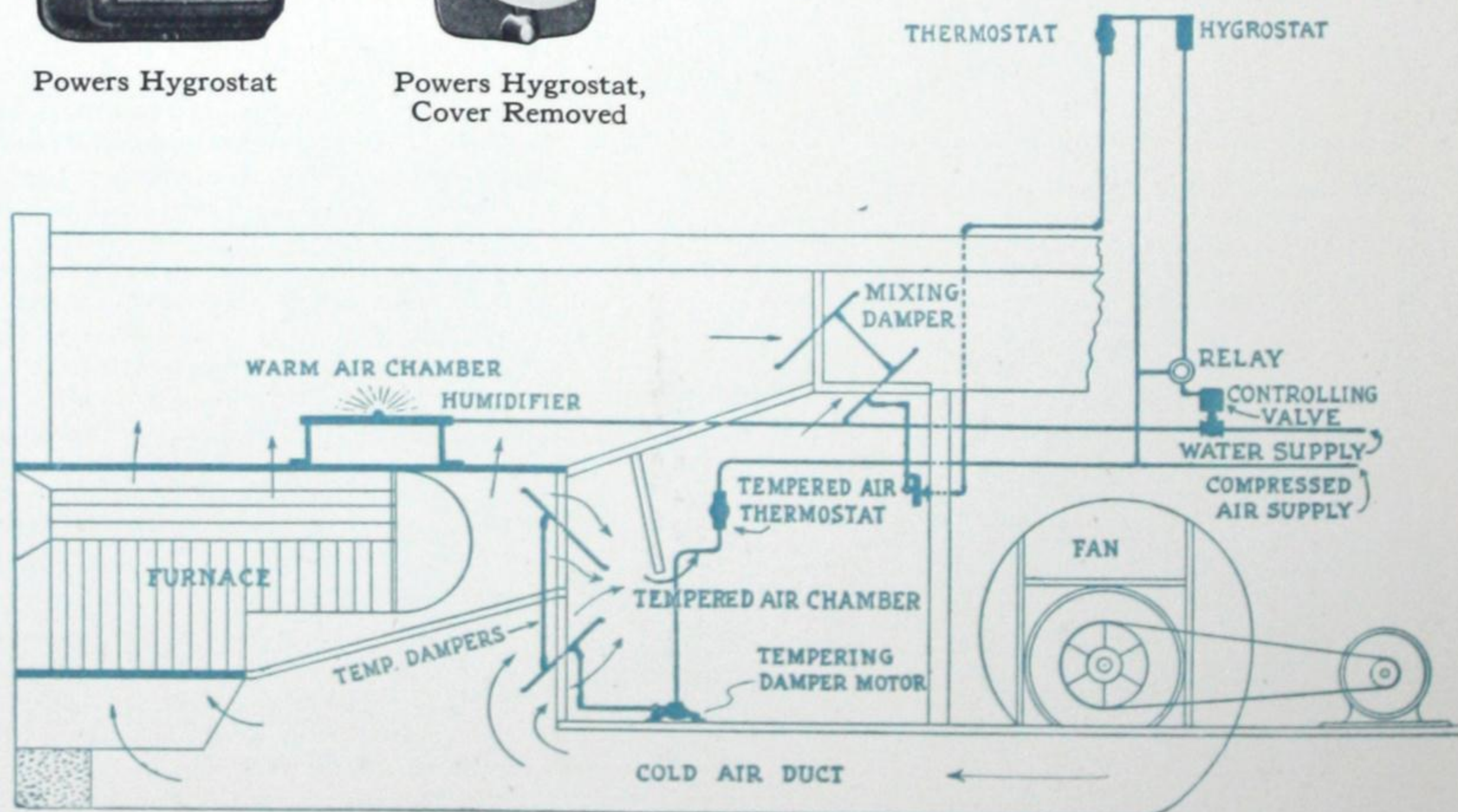
its appetite for moisture so greatly increased, attacks viciously the membranous surface of the throat and nasal passages, causing an unnatural dryness of these parts with consequent tendency toward the troubles mentioned. It also deprives the skin of its natural protection of moisture. People often complain of cold in a temperature as high as 75°, because of the chilling effect of this rapid evaporation of the moisture from the skin. Likewise, moisture will be drawn from woodwork and furniture, loosening joints, warping panels, and checking surfaces.



Powers Hygrostat



Powers Hygrostat,
Cover Removed



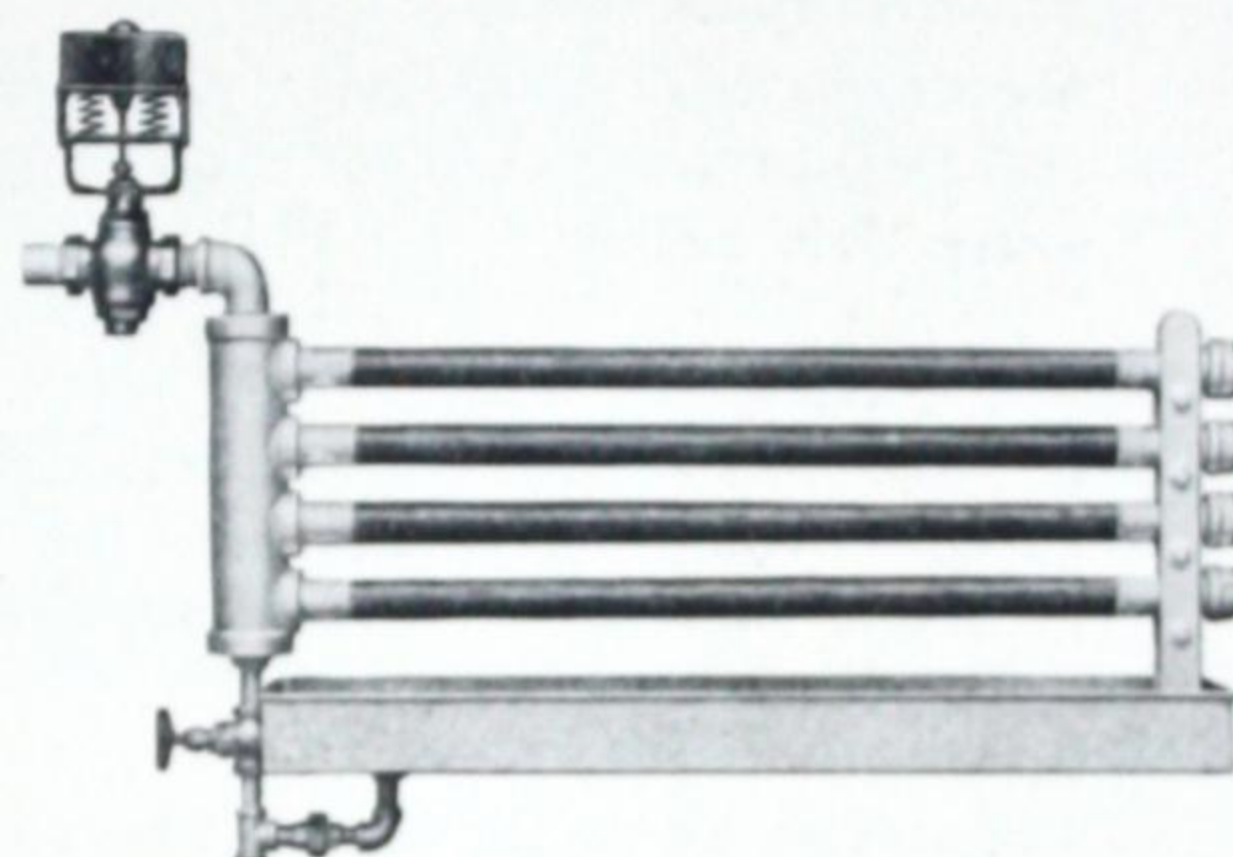
Powers Water Spray Humidifier Applied to Fan Furnace System

The Powers System of Humidity Control

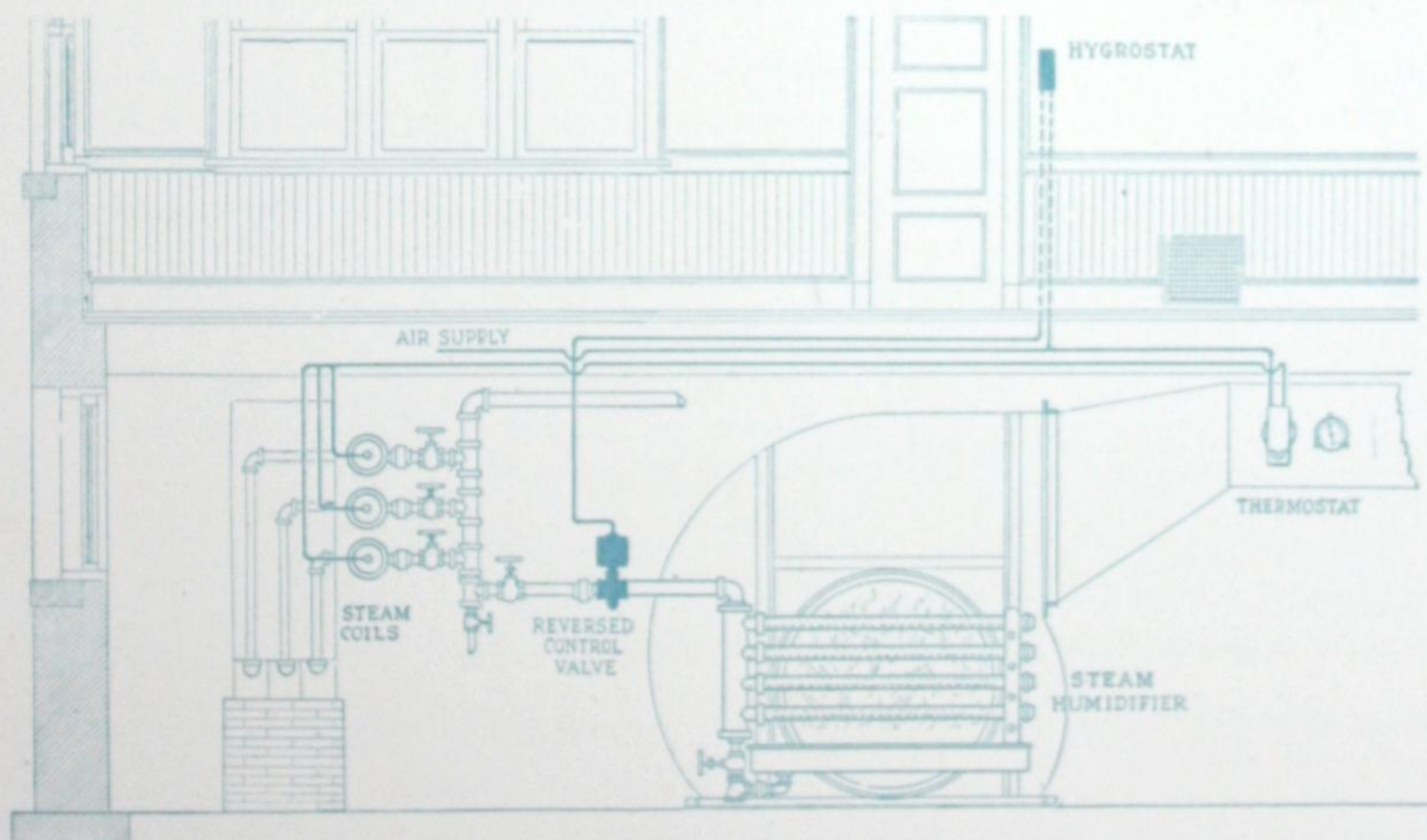
The Powers System of humidity control can easily be applied to any building using a ventilating system and equipped with Powers Temperature Control. This equipment automatically supplies the heated air with the needed moisture, accurately limiting the humidity content so that moisture will not condense on outside walls and windows. The fan system used for ventilation permits thorough mingling of vapor with the air that is forced into the rooms.

The drawings show typical installations of the Powers Humidifying Apparatus. In each case the hygostat, centrally located in the building, regulates automatically the amount of moisture supplied to the air before it is delivered to the room. Compressed air for the operation of the hygostat is taken from the temperature controlling system. Steam supplies moisture where the steam heating system is used—city water where the heating plant is of the fan-furnace type. The controlling valve is of the reversed type and the hygostat so constructed that it delivers air to valve with falling humidity, this insuring automatic closing of valve when system is not in operation.

Powers Humidifiers are carefully made and designed to distribute the moisture thoroughly through the air. They are noiseless in operation, an essential because of the tendency for sound to telephone along the ventilating ducts. The perforated pipe Steam Humidifier is provided with a drip to care for condensation.



Powers Steam Humidifier



Powers Steam Humidifier Applied to Steam Fan System

How to Judge a Temperature Control System

Special equipment, such as that used in temperature control, is purchased to give a definite service. That it renders this service in a satisfactory manner, is of prime importance. In considering the relative effectiveness of proposed temperature control systems, the following suggestions may prove of value.

1. Action of Thermostat.

Is it powerful? Must its thermostatic action be amplified?
Is its construction complicated?

2. Gradual Control.

Do dampers and valves move directly to the required adjustment and hold it, or do they swing back and forth from one extreme to the other?

3. Mechanical construction.

Are the parts of ample size? Are there restricted air passages that will easily clog? Are there adjustments that will require constant regulation? Are there numerous parts to cause "lost motion?"

4. Past Performance.

If possible, observe actual installations in operation. Notice how the dampers and valves operate. Find out how the systems perform in actual use. Are even temperatures maintained? How much adjustment and attention is required?

5. Reputation of Makers.

The service a firm has rendered its customers in the past is the best criterion of the service it will give in the future. It is essential that the Company behind the installation be both thoroughly reliable and substantial because automatic control is installed to serve throughout the life of the building in which it is placed.

6. Quantity of Air Used—Permanent "Leaks."

The quantity of air used is most important because large quantities mean that correspondingly large amounts of dust and moisture will be introduced into the system. Permanent "leaks," too, require restricted, easily clogged passages, and must be equipped with adjusting devices.

7. Yearly Earnings.

This should be carefully considered when a temperature control system is to be purchased. It is more important than the cost of the system. There is involved—

Depreciation based on probable life of apparatus.

Cost of repairs.

Cost of attendance.

Interest on investment.

Fuel economy resulting from its use.

Read what our customers say about the long life and effectiveness of Powers Systems.

An Engineering Opinion of the Powers System

Seldom is an opportunity given for a truly impartial survey of this subject of automatic temperature control. Such a survey, however, was made recently for the Indianapolis Board of School Commissioners—and it included a study of practically all automatic temperature control installations in Indianapolis, both in schools and commercial buildings. The report made to the school board by the firm of consulting engineers employed to make the investigation was significant, far-reaching, emphatic. The investigation was based on examination and history of four different systems and the findings are summarized in the following extracts from the report:

“The whole purpose of installing temperature regulation is to maintain a constant temperature in the rooms at all times, and by so doing not only to promote the comfort of the occupants of the room, but by avoiding overheating reduce the consumption of fuel to a minimum. If temperature regulation fails to accomplish this purpose we would not consider it worthy of consideration.

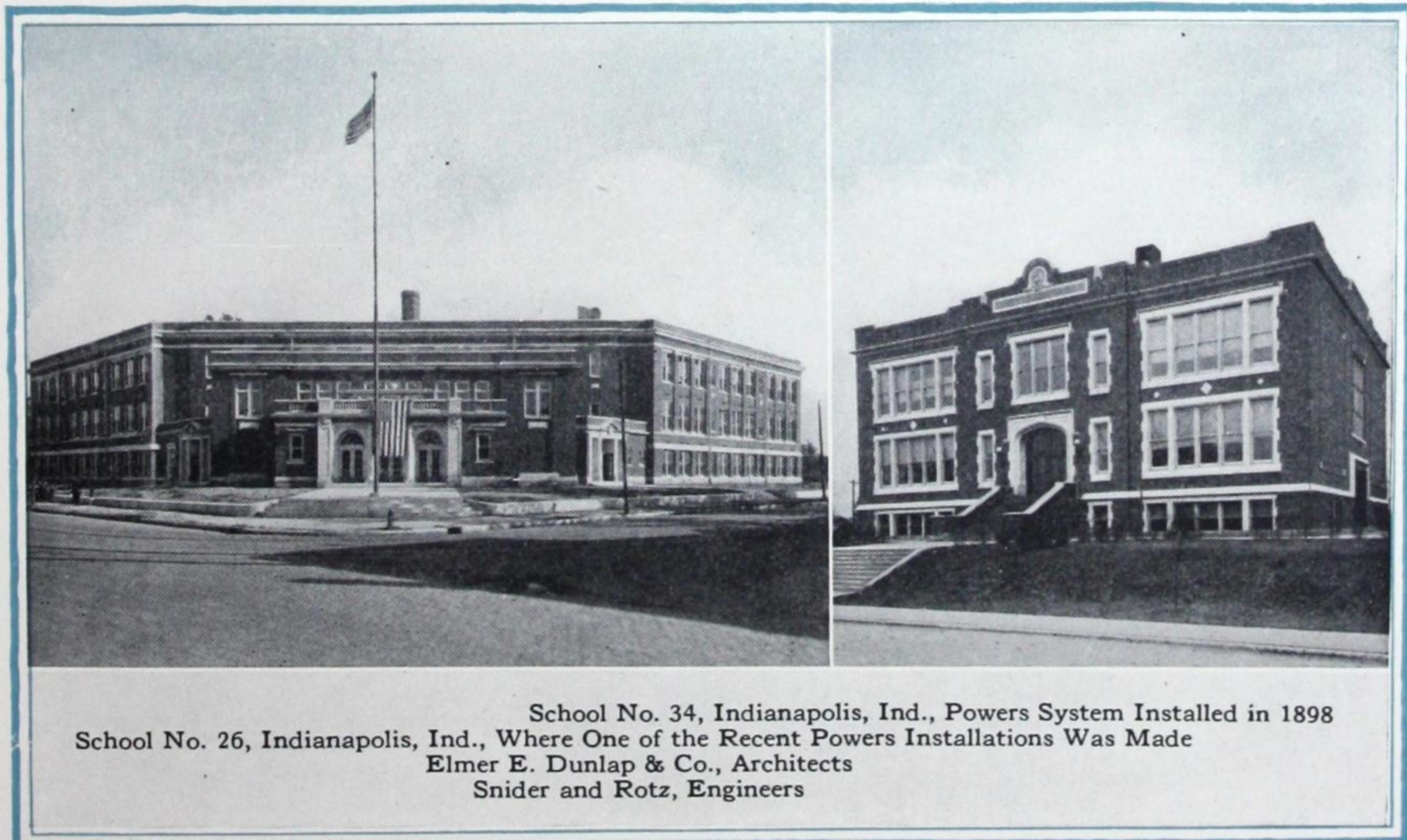
The only real job of regulation in the Indianapolis Schools that has been operating successfully since its installation is the Powers regulation job at School No. 34. This is a very fine installation and has given perfect satisfaction.

We find that the Powers system is very satisfactory as installed in the American National Bank Building, Ayers Department Store, Eli Lilly and Company, Keith's Grand Opera House, H. McKay Landon residence, and the Robert Long Hospital, all in Indianapolis.

In order to make this report to the board it has been necessary to speak very plainly, but we have thought that the board desired to have “plain facts.”

Subsequent to above investigation Indianapolis has equipped 10 school buildings with Powers Regulation.

NOTE—This report may be seen in full at the office of the Board of Education, Indianapolis, Ind.



The Powers System of Temperature Control



Willys-Overland Administration Building
Toledo, Ohio
Mills, Rhines, Bellman & Nordhoff, Architects

The installation in this building was made in 1916, and includes 200 thermostats controlling 500 radiators. A forced hot water system is used. The perfect results obtained under the Powers System of Control are attested to in the letter reproduced.

The Powers System with its graduated valve control is particularly adapted to hot water circulation.

THE WILLYS-OVERLAND CO.
AUTOMOBILES
TOLEDO, OHIO
JOHN N. WILLYS, PRESIDENT

October 4, 1922.

The Powers Regulator Co.,
2720 Greenview Ave.,
Chicago, Ill.

Gentlemen: The Powers System of Heat Regulation installed in our Administration Building six years ago and comprising approximately 200 thermostats controlling 500 radiators, has given us most excellent service, has required no repairs, and apparently shows no deterioration up to the present time.

Yours very truly,
L. A. Miller, Secretary.



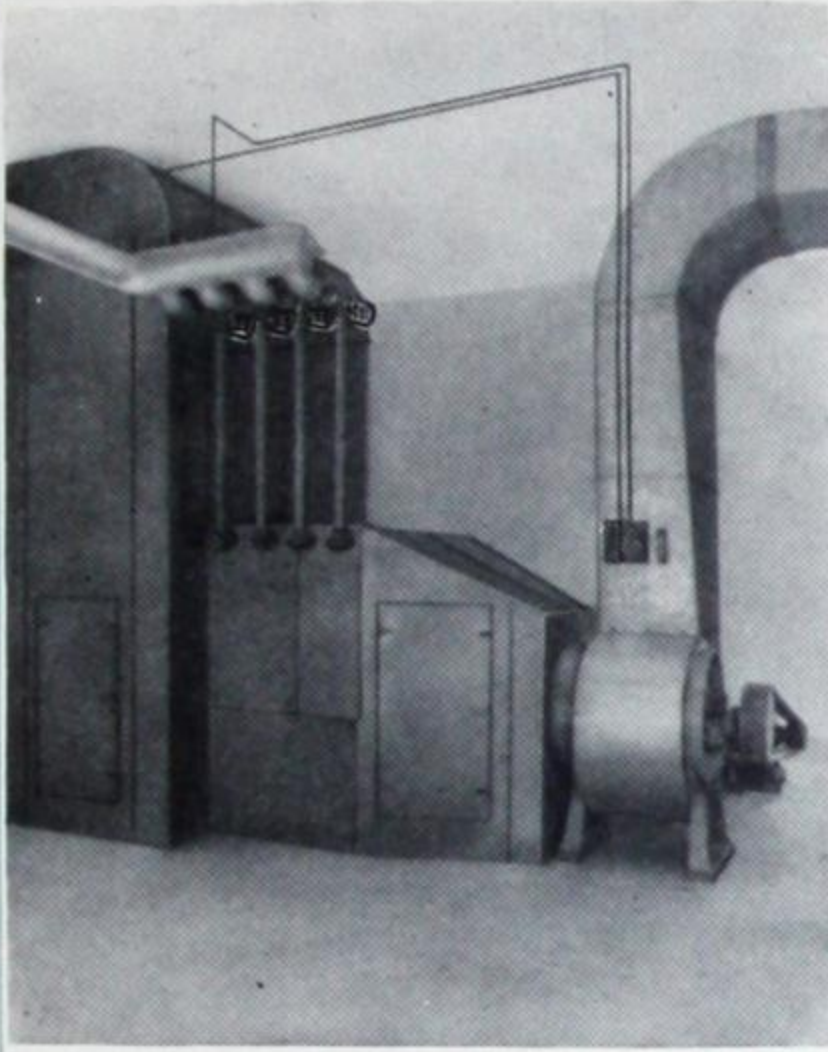
B. & O. R. R. Annex Building
Baltimore, Ohio



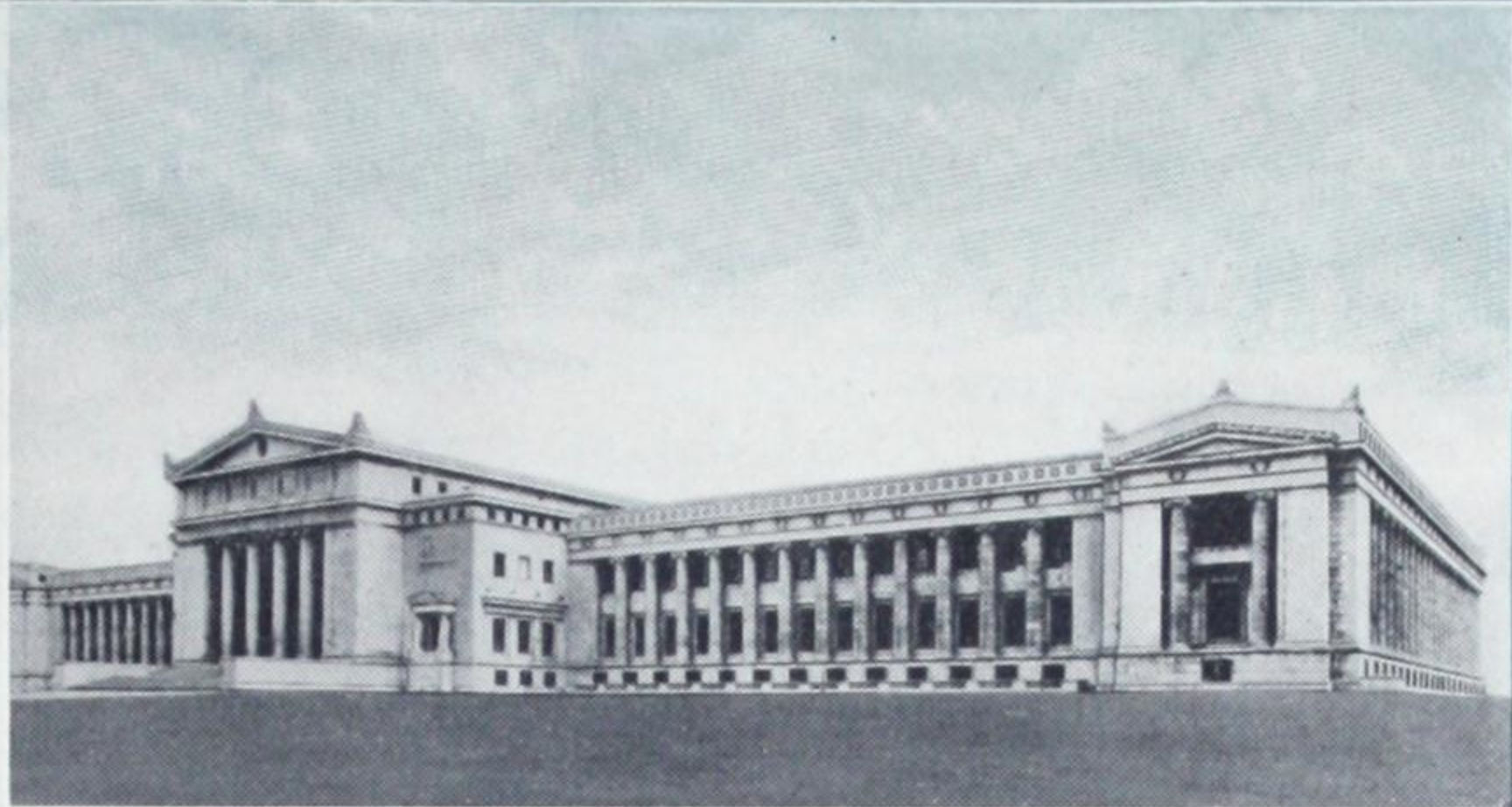
Iving-Pitt Manufacturing Company
Kansas City, Mo.

The Powers System of Temperature Control

The extensive Ventilating System in the Field Museum of Natural History, Chicago, is completely equipped with Powers Control.



A view of Powers Temperature Control applied to one of the Ventilating Systems in the Field Museum of Natural History, Chicago.



Field Museum of Natural History Building, Chicago, Ill.
Graham, Anderson, Probst and White, Architects

January 9, 1923

The Powers Regulator Company,
2720 Greenview Avenue,
Chicago, Illinois.

Gentlemen: Referring to your letter of December 28th, I beg to advise that the Museum has three Fresh Air Fans with the Regulators as part of the equipment for heating the air. The Institution has had no trouble with your Regulators, and the Chief Engineer states that they are dependable in their action and much simpler than any Regulators he has heretofore operated. Very truly yours,

D. C. Davies, Director.



Powers Control is used on the Ventilating System and all Direct Radiators in the Michigan Union Building, Ann Arbor, Mich.

Pond and Pond, Chicago, Architects
Charles G. Atkins, Chicago, Mechanical and Electrical Engineer

Seventeen-Year Service Record—for a Single User

RECORD IN SEARS, ROEBUCK & CO. PLANTS

In 1905 the engineers of Sears, Roebuck and Company selected the Powers System for the first unit of their Chicago group of buildings.

In the 17 years following that date the twelve repeat orders listed below were given for Powers Systems—every new building having been equipped with Powers Temperature Control. The twelfth order covered equipment for the Sears, Roebuck buildings in Philadelphia, one of the largest single installations of temperature control ever made.

SEARS ROEBUCK INSTALLATIONS

Installed	Location	Installed	Location
1905	Administration Bldg.	1913	Cold Storage Bldg.
1907	Merchandise and Annex Bldg.	1915	Seattle Branch
1910	Printing Building Annex	1916	Addition to Administration Bldg.
1910	Merchandise Bldg.	1916	Treatment Room in Basement of Administration Bldg.
1912	Section "I" Merchandise Bldg.	1917	Addition to Sec. L-M-N-O,—Annex A
1913	Grocery Bldg.	1920	Philadelphia Branch, all buildings
1913	Manufacturing Bldg. No. 1		
1913	Shipping Platform		
1913	Section R & S Merchandise Bldg.		

There is no better proof of the quality of the Powers Systems of Temperature Control than the outstanding satisfaction of those who use them.

AN INTERESTING RECORD OF SERVICE FOR A SCHOOL BOARD

The service rendered by Powers equipment in the Hartford schools is typical. Repeat orders are the natural consequence. Only service of this kind is, in the long run, profitable to either the manufacturer or the user.

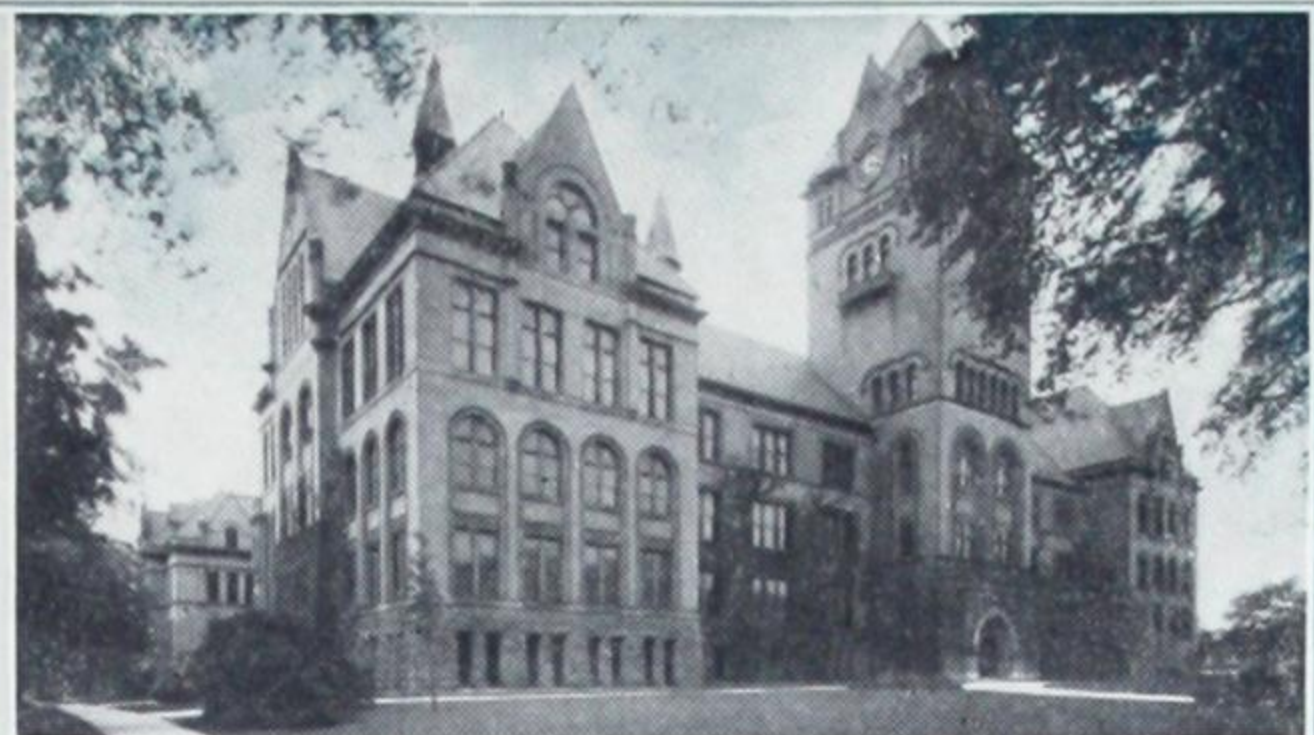


Hartford High School
Davis and Brooks, Architects
Original Installation 1897 2nd Addition 1913
1st Addition 1903 3rd Addition 1917

The Powers System of Temperature Control



Saunders School, Omaha, Nebr.
John Latenser, Architect



Central High School, Detroit, Mich:
Malcomson and Higginbotham, Architects

BOARD OF EDUCATION SCHOOL DISTRICT OF OMAHA

D. FINLAYSON, SUPT. OF BUILDINGS
2024 NICHOLAS ST. PHONE WEBSTER 5021
OMAHA, NEBR.

Oct. 16th, 1922.

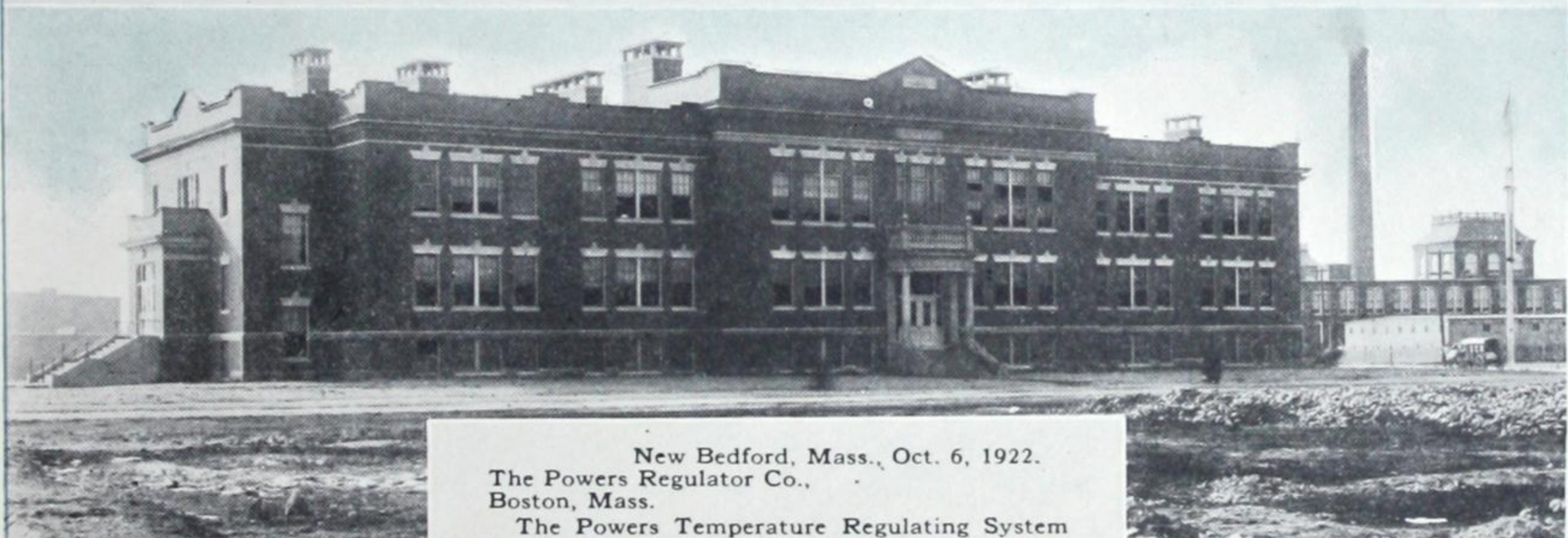
Powers Regulator Co.,
407 E. 13th St., Kansas City, Mo.

Gentlemen: Answering your inquiry will say that the Powers System of regulation installed in the Saunders School Building in 1900 is still in operation and doing good work. The repairs required have been trifling in this as well as in other buildings of ours which have your system.

Yours truly,
D. FINLAYSON, Sup't of Bldgs.



Morris High School, New York City, N. Y.
C. B. J. Snyder, Architect



John B. DeValles School
New Bedford, Mass.

New Bedford, Mass., Oct. 6, 1922.
The Powers Regulator Co.,
Boston, Mass.

The Powers Temperature Regulating System has been in use in the New Bedford High School since 1912; in the John B. DeValles School since 1914; in the Abraham Lincoln School since 1911. These installations have given good service at a small expense for repairs and replacements.

(Signed) D. H. Ferguson, Inspector of
School Property.

E. G. Bullard, Architect
Geo. Huey, Engineer



Abraham Lincoln School, New Bedford, Mass.
Louis Destremp, Architect & Engineer



New Bedford High School
Clough & Wardner, Architects R. D. Kimball & Co., Engineers

The Powers System of Temperature Control



Michigan State Telephone Building,
Detroit, Michigan
Smith Hinchman and Grylls, Architects



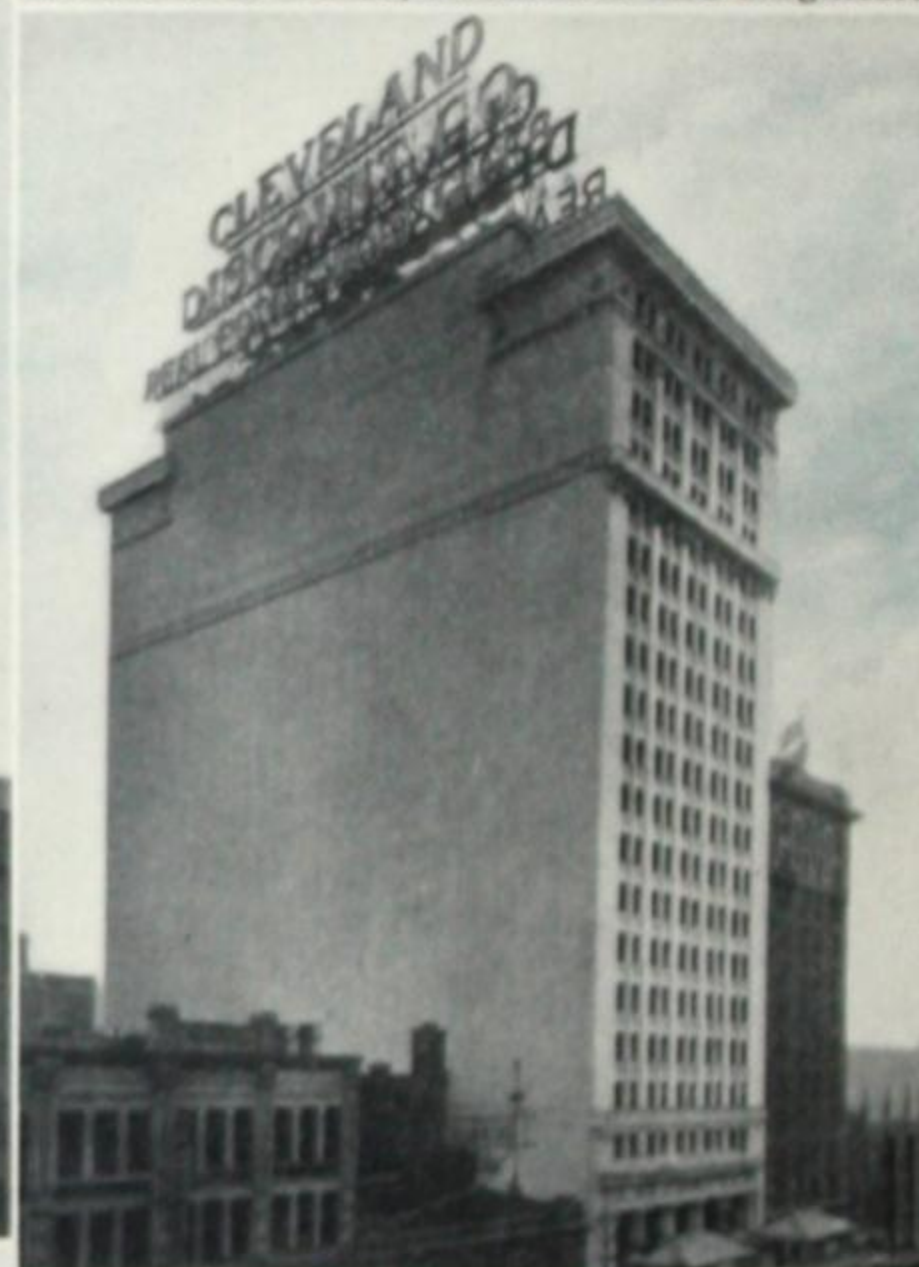
Chicago Telephone Company's Building,
Chicago, Illinois
Holabird & Roche, Architects and Engineers



The Dominion Bank, Toronto, Canada
Darling and Pearson, Architects



Federal Reserve Bank Building,
Kansas City, Mo.
Graham, Anderson, Probst and White
Architects



Cleveland Discount Building, Cleveland, Ohio
Walker & Weeks, Architects



Franklin Life Insurance Building, Springfield, Ill.
Helmle and Helmle, Architects



Grain Exchange, Winnipeg, Canada
Darling and Pearson, Architects
Installed 1909; Additions, 1913-14-16-22

The Powers System of Temperature Control



Bureau of Standards Laboratories
Agricultural Department Laboratories
United States Government Buildings, Washington, D. C.

Uniform temperatures are essential to thousands of investigations carried on in these buildings. Powers apparatus was installed after a thorough investigation when the sole determining factor was performance.



Minnesota State Capitol, St. Paul, Minn.
Cass Gilbert, Architect



Federal Reserve Bank, Boston, Mass.
R. Clipston Sturgis, Architect

St. Paul, Minn., Dec. 30, 1922.

The Powers Regulator Co.,
Chicago, Ill.

Dear Sirs:-

Yours of the 28th December regarding the Powers System of Heat Regulation, in the Minn. State Capitol Bldg., would state it has been in constant use since 1903, and is still working satisfactorily. Outside of regular repairs we have had very little trouble and it is still good for another long period.

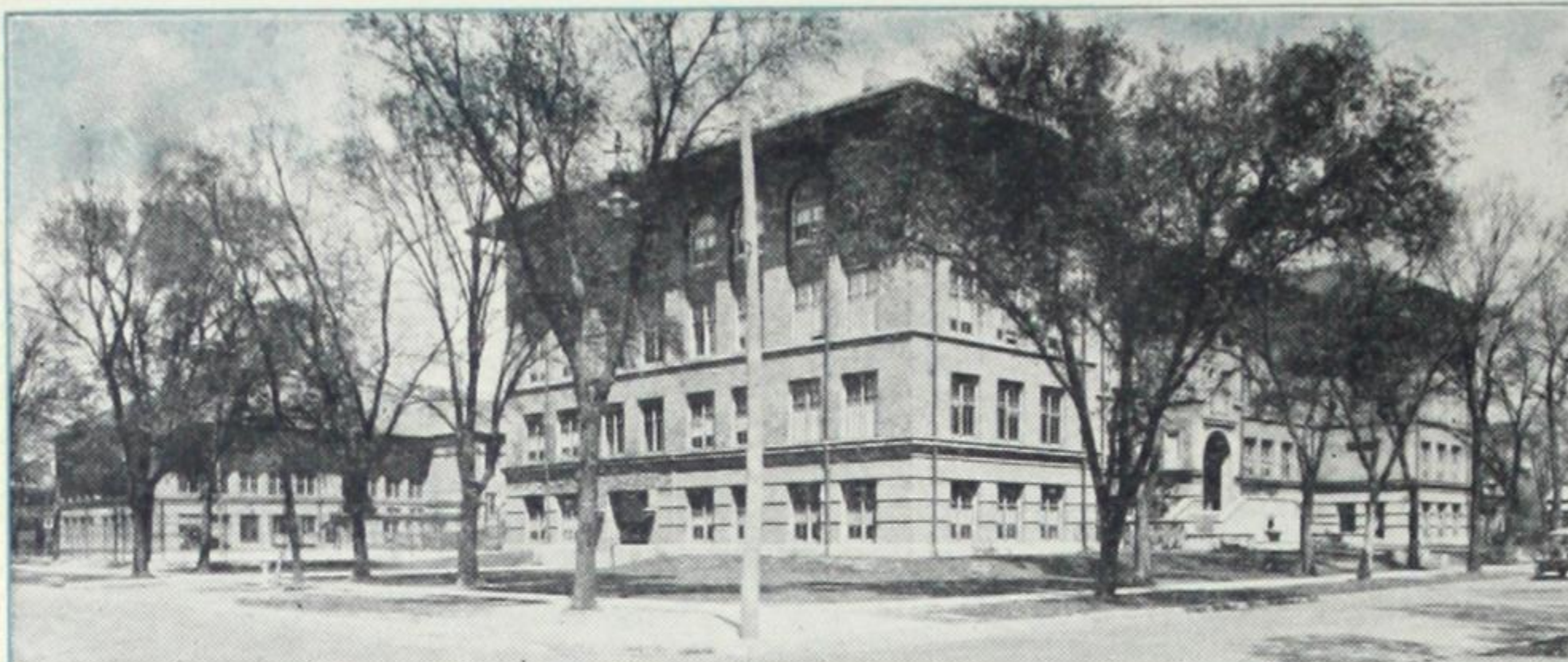
Respectfully yours,

ALEC NICOLL,
Chief Engineer.

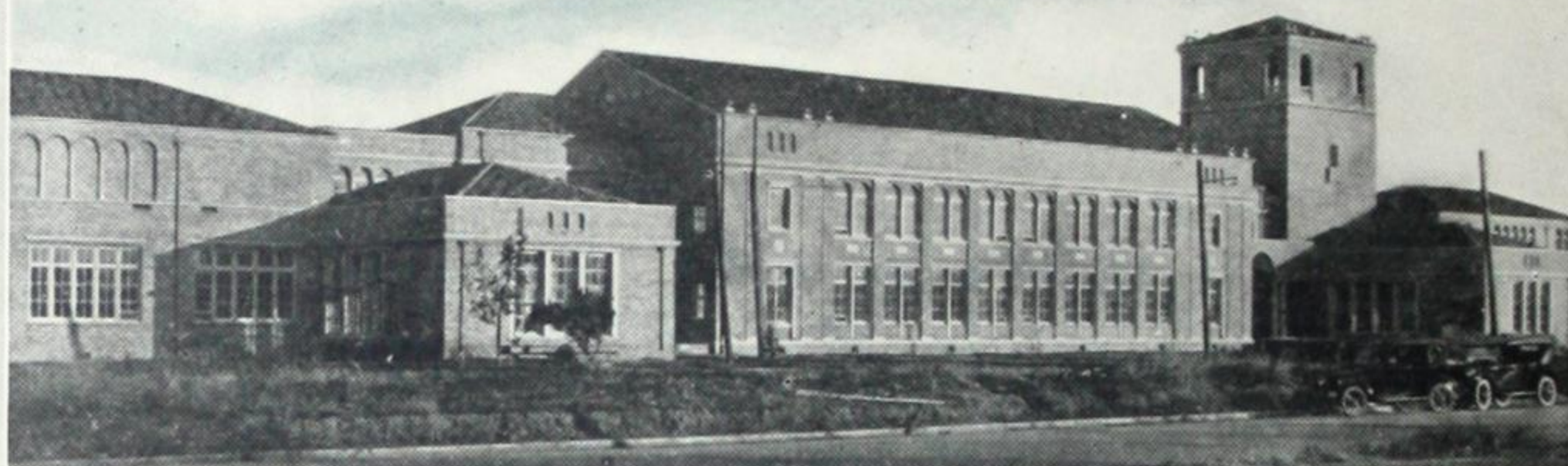


Supreme Court Building
Springfield, Ill.
W. Carlys Zimmerman, Architect

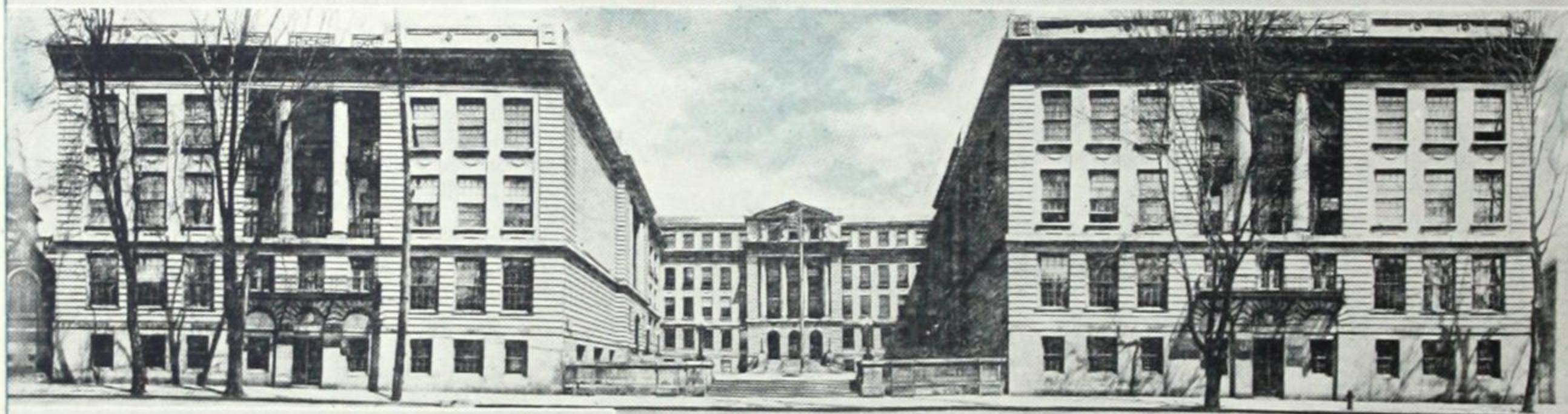
The Powers System of Temperature Control



Oak Park High School Building,
Oak Park, Ill.
Holmes & Flinn,
Architects



High School, Sacramento, California
Edgar A. Mathews and H. G. Simpson Architects.



Montreal, October 10, 1922
The Engineers' Supply Co.,
612 New Birks Building, Montreal.

Gentlemen: I am pleased to state that the High School of Montreal has been equipped with the Powers Temperature Control for a number of years, and is operating perfectly.

This is, of course, only one of the numerous schools equipped with this system, and in every case complete satisfaction has been rendered.

We cannot speak too highly of the service end of this work, as we have always been given prompt and courteous attention, combined with very reasonable charges.

Yours truly,

E. B. PALMER,
Inspector of Buildings.

High School Building, Montreal



Junior High School, Newtonville, Mass.
Brainard & Leeds, Architects
Alfred Kellogg, Consulting Engineer

Typical Records of Long Service



COUNTY OF LUCAS TOLEDO, OHIO

Oct. 2, 1922.

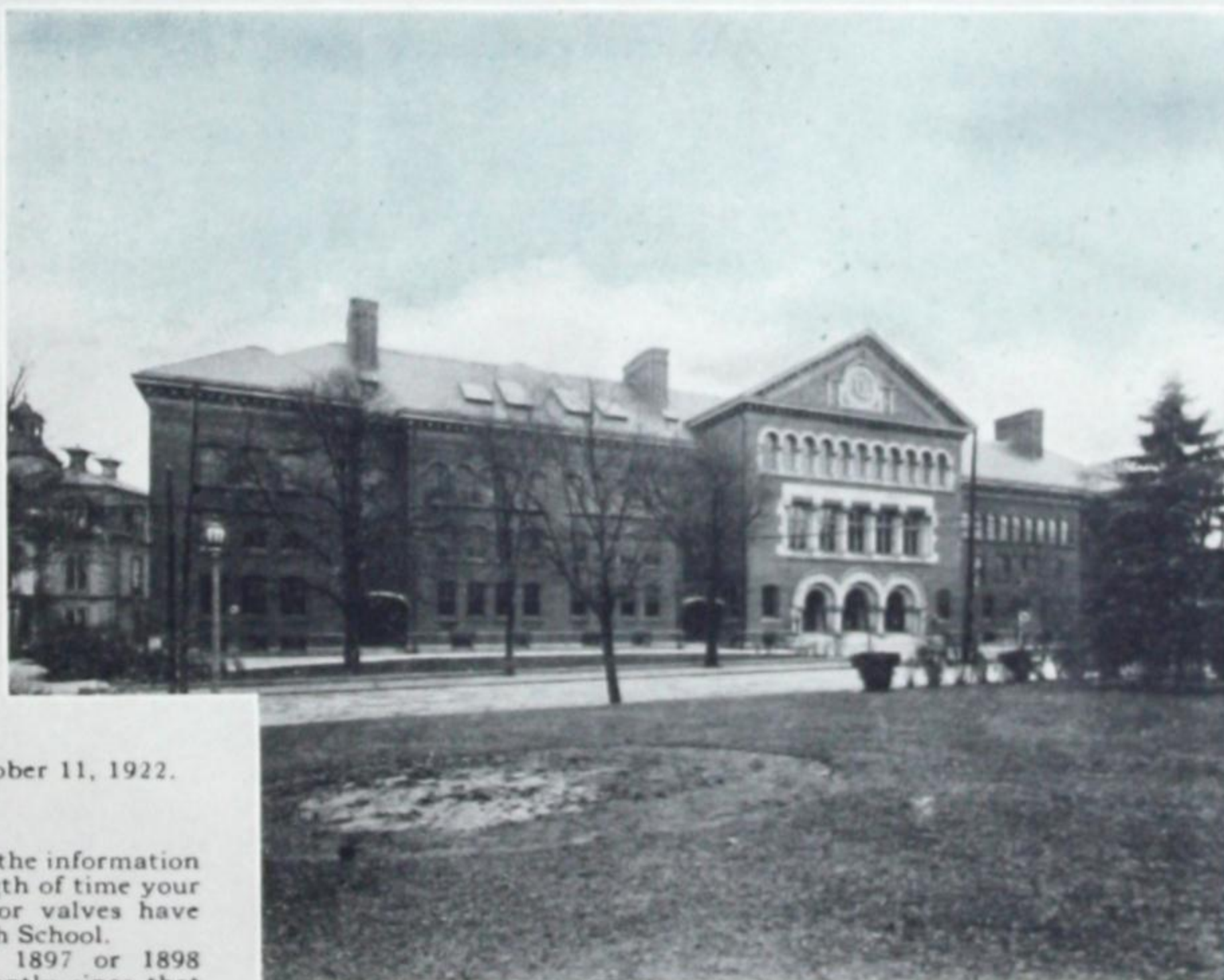
Our Court House is equipped with the Powers System of Heat Regulation, installed in 1896 and in continuous service since then. We ourselves, have been able to give it any attention it has needed from time to time and have found it very satisfactory.

Yours respectfully,

WALTER H. HALL,
Chief Engineer

Lucas Co. Court House, Toledo, Ohio.

A Powers Temperature Control System in the Lucas County, Ohio, Court House has been giving uninterrupted satisfaction since 1896.



Malden, Mass., October 11, 1922.

Powers Heat Regulation Co.,
Boston, Mass.

Gentlemen: I am sending you the information you requested concerning the length of time your thermostats and diaphragm motor valves have been in service in the Malden High School.

The system was installed in 1897 or 1898 and has been in operation constantly since that time and the cost of maintaining it has been practically nothing to the City.

At the time of installation there were 22 rooms in the building, all equipped with thermostats and diaphragm motor valves and in 1906 when the addition was made to the building 34 thermostats, 37 damper valves were added and 9 motor valves in connection with the tempering coils, and 12 motor valves in the main vent dampers.

I have had ten years experience in this building with your system and I am very glad to recommend it at every opportunity. The cost of operation is very small.

Very truly yours, JOSEPH T. TUPPER,
Engineer, Malden High School.

The durability and consistent operation of the Powers thermostat is proven by the uninterrupted service of this 25-year-old installation at the Malden High School.

Some More Records of Long Service



High School, Wilkesburg, Pa.
Thomas H. Scott, Architect

October 2, 1922.

Powers Regulator Co.,
Pittsburgh.

We have had your system of temperature regulation in the Wilkesburg High School for a period of twelve years. We are entirely satisfied with this system in every respect. The thing that pleases us most about it is the fact that no adjustments are needed when the heating season starts after being shut down all summer. During the time it has been in service we have had no replacements of any kind until last year when we replaced several rubber diaphragms and had the system gone over thoroughly.

We can certainly recommend your system for complete satisfaction and as proof of this we are now installing it in the Johnson School which was rebuilt after a fire which destroyed the building completely.

Yours very truly,
J. W. SINGLETON, Chief Engineer,
Wilkesburg School District.



First Church Christ Scientist, Buffalo, Y. N.
R. D. Kimball & Co., Architect

October 27, 1922.

The Powers Regulator Co.,
Buffalo, N. Y.

Attention Mr. M. S. Jackson.

Dear Sir:

Regarding your inquiry through our custodian some time ago as to how we liked the Powers system of regulation we are very glad to advise you as follows:

This system was installed in our Church Bldg. in 1911 controlling approximately 22 rooms, and will say that we have been very much pleased with the service that we have received from this system. This system has been operated continuously and other than occasional cleaning of the air compressor no repairs have been necessary since installation, so you see we are very much pleased.

Trusting this will answer your inquiry I remain,
Yours truly, J. W. HOLBROOK,

Chairman of House Committee,
First Church of Christ Scientist, Buffalo, N. Y.



High School, Haverhill, Mass.
Kilham and Hopkins, Architects

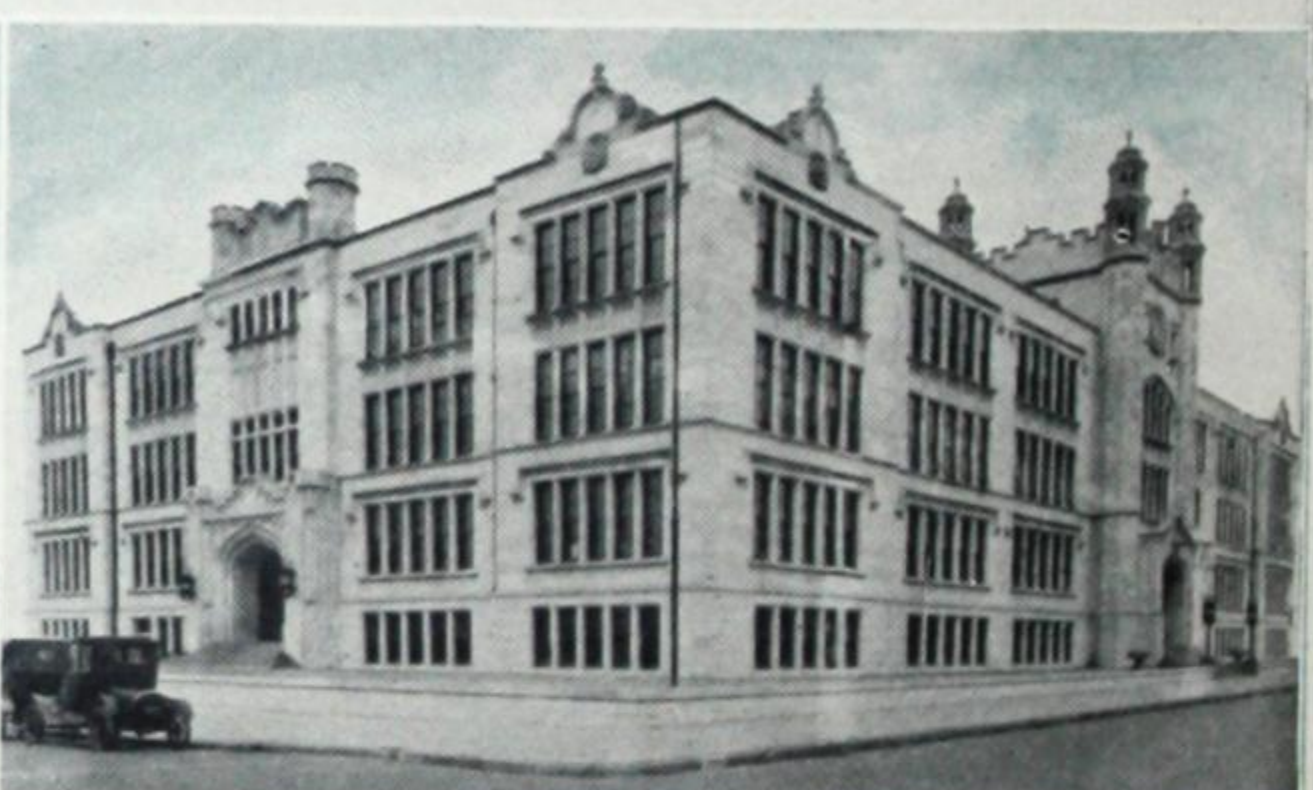
THE HIGH SCHOOL
HAVERHILL, MASS.

ARLINGTON I. CLOW
HEAD MASTER

Powers Regulator Co.,
Boston, Mass. October 9, 1922

Gentlemen: We had your system of heat control installed in our high school in 1910. It has been very satisfactory in its operation, and with no expense for repairs up to date.

Very truly yours,
Samuel R. Moss, Chief Engineer.



High School, Oklahoma City
Evans Almirall & Co., Construction Engineers
Layton, Smith & Hank, Architects

November 13, 1922.

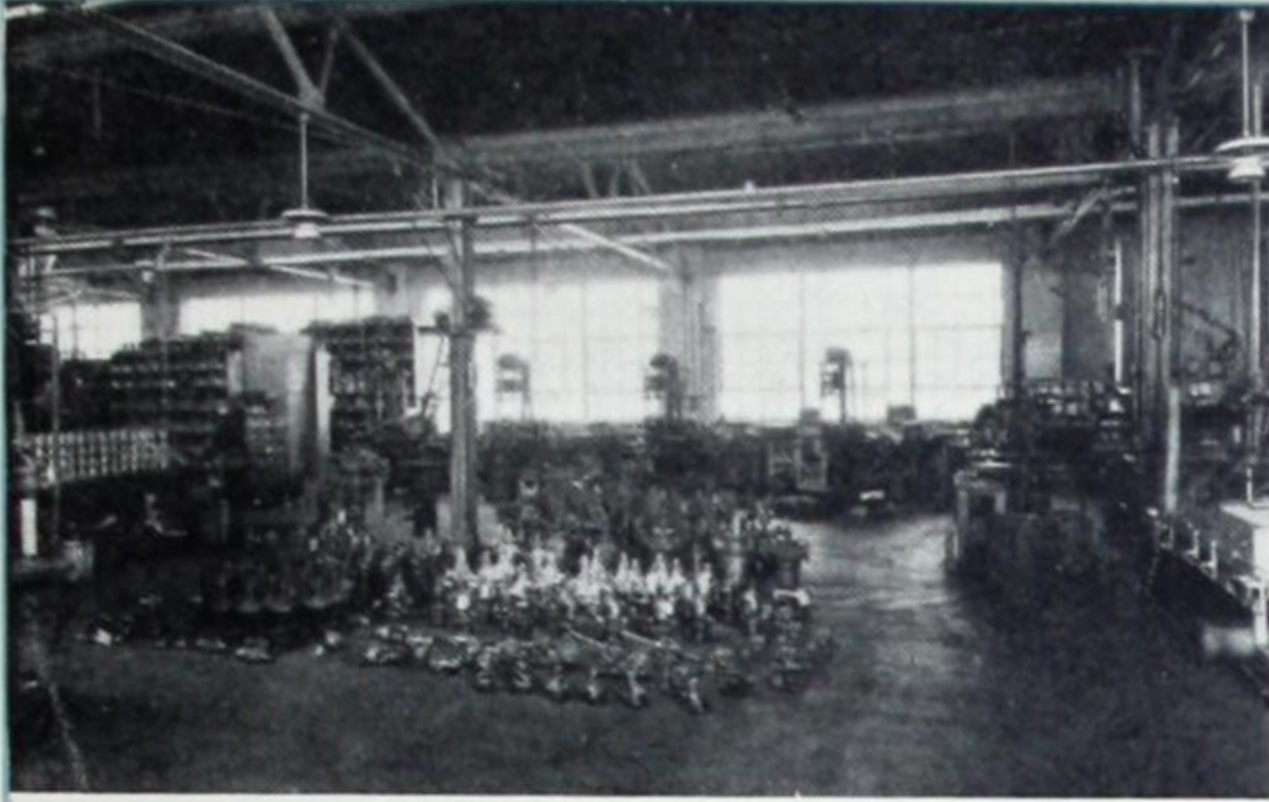
Mr. L. A. Stephenson, Branch Manager,
The Powers Regulator Company,
Kansas City, Missouri.

Dear Sir: In reply to your recent inquiry with reference to your system of temperature regulation installed in our High School building in 1910, will say that this system is still giving excellent satisfaction. There are about seventy-five rooms controlled and the temperature in all of them is maintained practically uniform. There has been no repair expense so far.

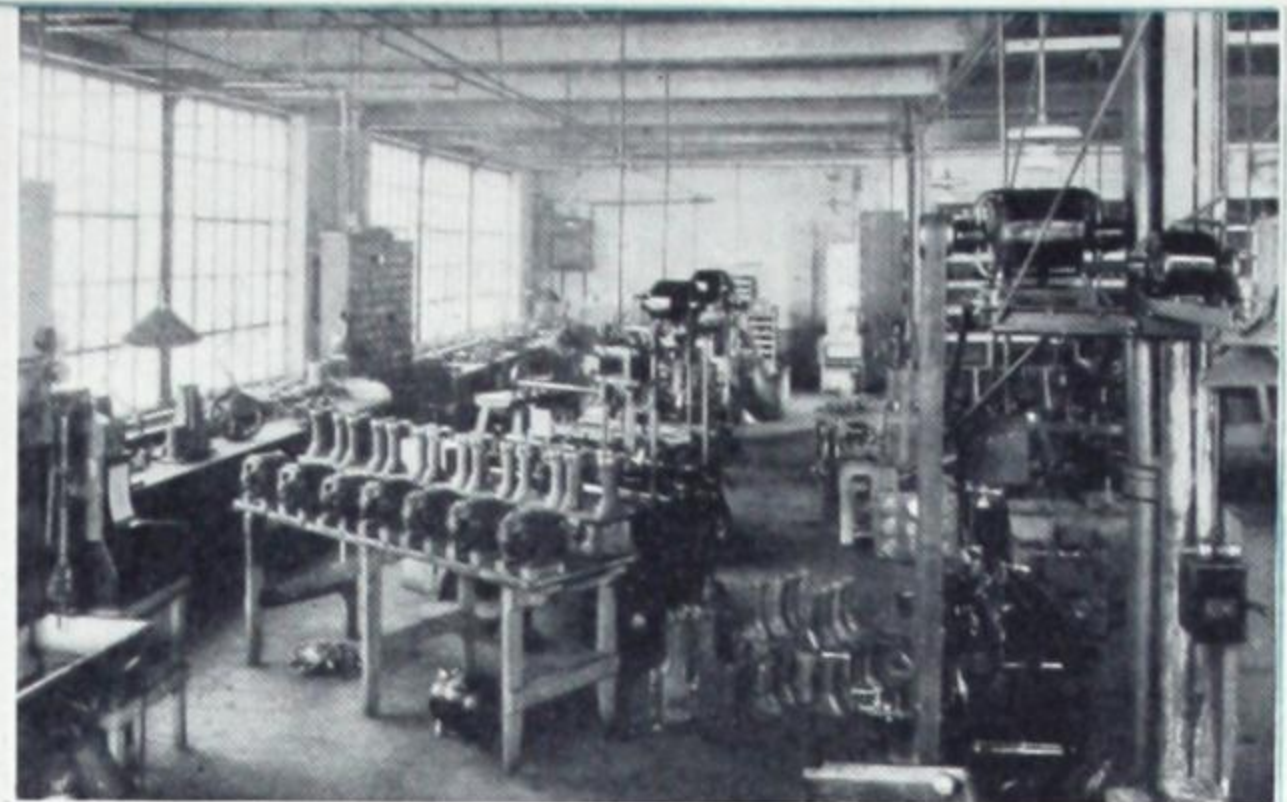
We also have three Junior High School buildings of thirty rooms each equipped with your temperature regulation and a number of your installations in our Grade School buildings, all of which are giving excellent results. Yours very truly,

The Board of Education of Oklahoma City, Okla.
By J. G. STEARLEY, Clerk.

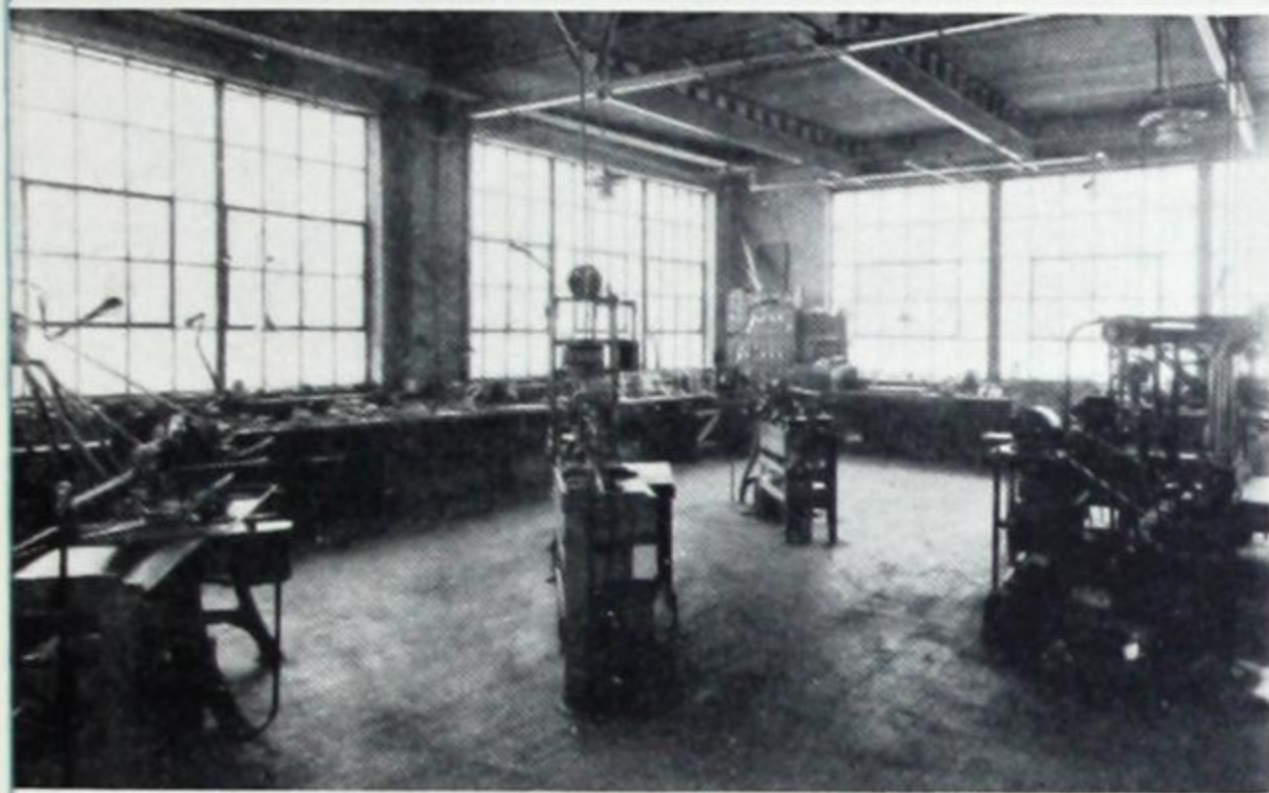
Where Powers Systems Are Manufactured



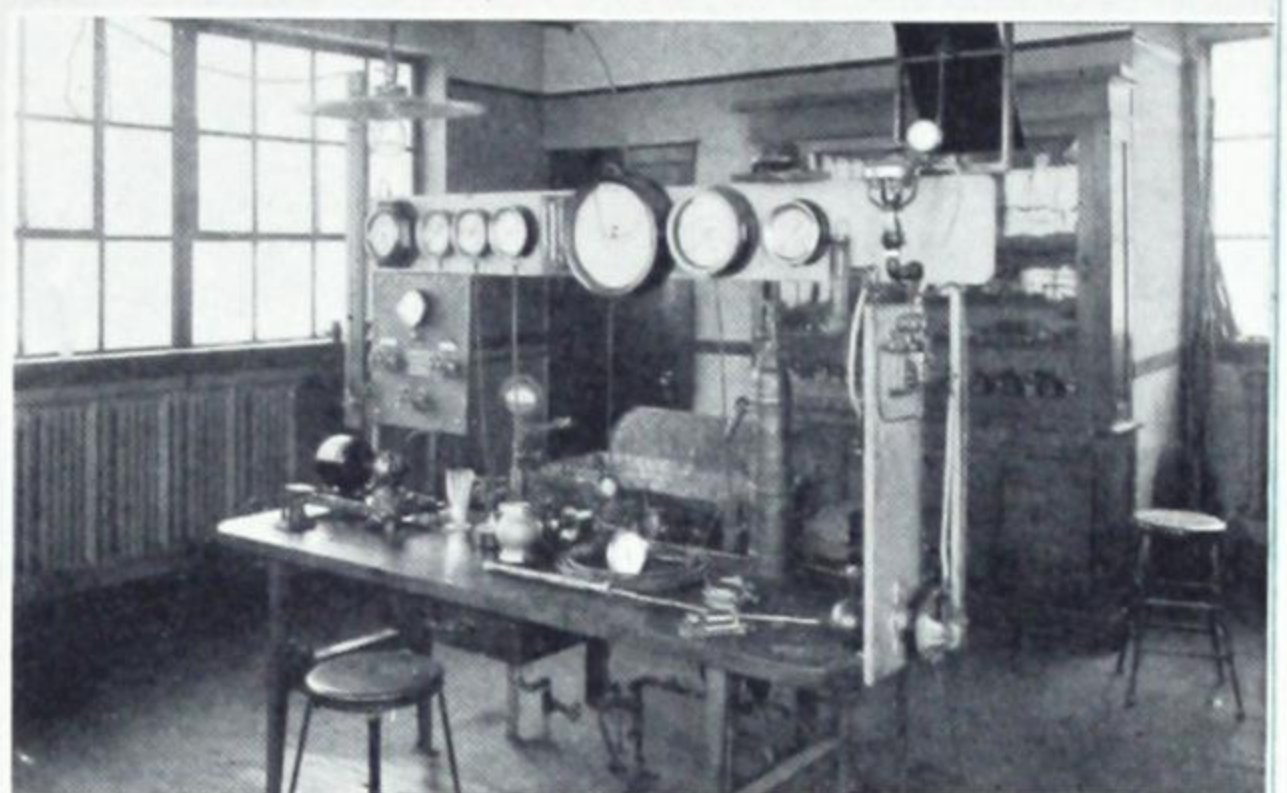
Water Control Department



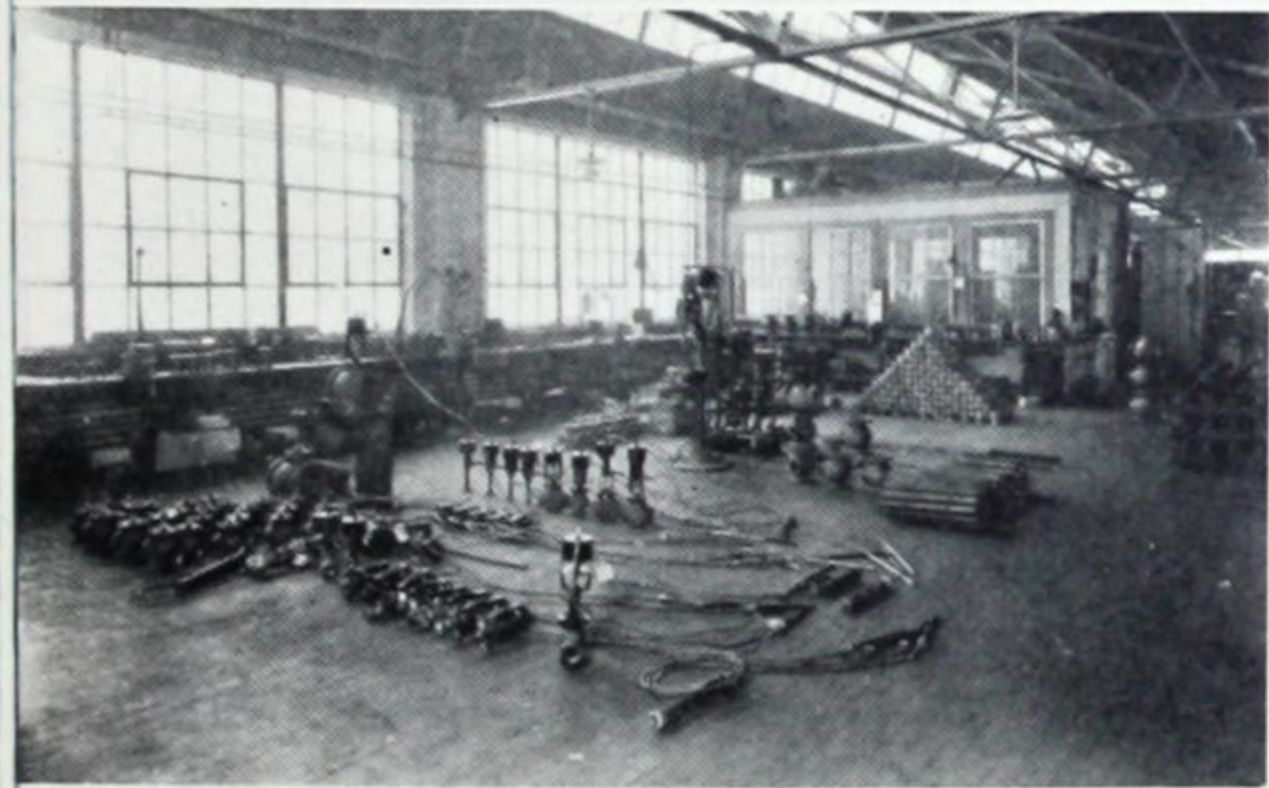
Where the Air Compressors are produced.



Thermostat Assembly Department



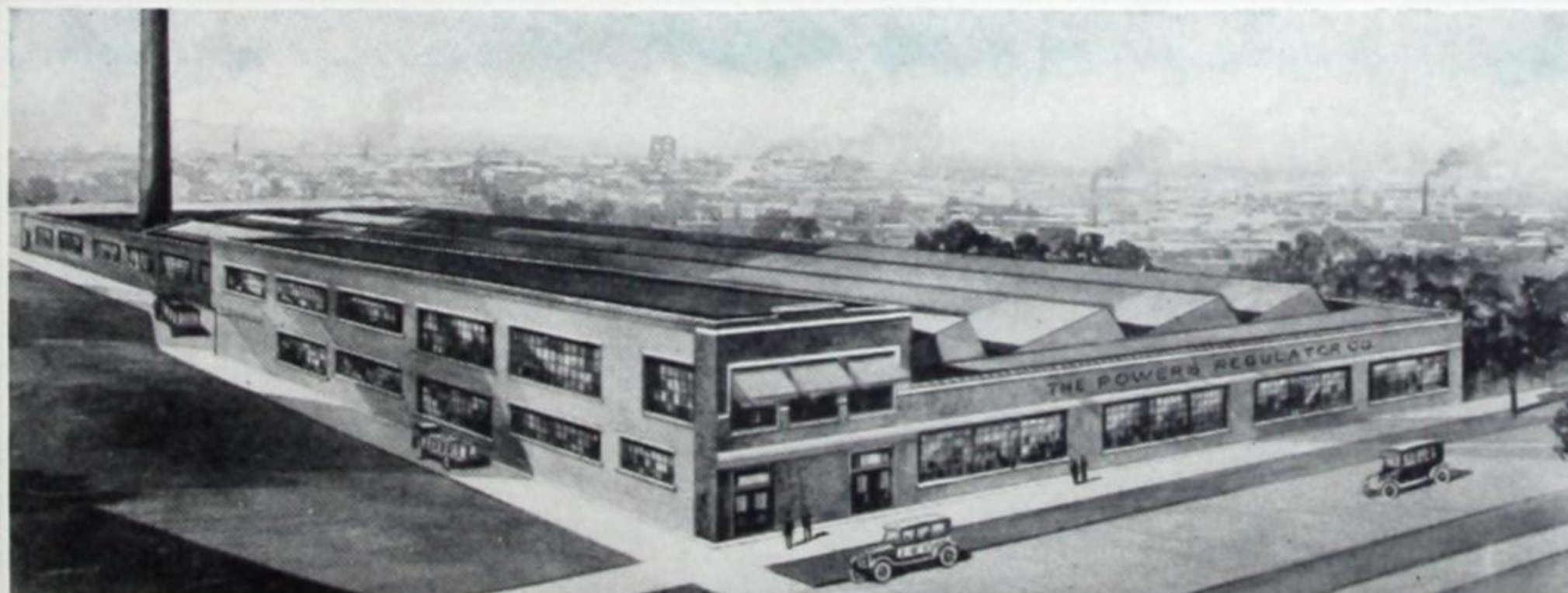
A Corner in the Engineering Department



Self Contained Regulator Department



Screw Machine Department



A view of the Modern Factory where Powers Systems are manufactured.

Prominent Users of Powers Regulation

RESIDENCES

LAKEWOOD, N. J.	J. D. Rockefeller	CLEVELAND, OHIO	H. A. Tremaine
WILMINGTON, DEL.	Irene du Pont	DAVENPORT, IOWA	J. L. Hecht
NARBERTH, N. J.	Percival Roberts, Jr.	DAVENPORT, IOWA	H. C. Kahl
GLEN COVE, L. I.	H. L. Pratt	DAVENPORT, IOWA	Judge N. French
GLEN COVE, L. I.	J. T. Pratt	DETROIT, MICH.	W. O. Briggs
NEW YORK CITY	J. S. Morgan	EVANSTON, ILL.	George Dryden
NEW YORK CITY	Thos. W. Lamont	EVANSTON, ILL.	Charles Ringling
KATONAH, N. Y.	William Fahnestock	GROSSE POINTE, MICH.	D. M. Ferry
OYSTER BAY, L. I.	B. G. Work	GROSSE POINTE, MICH.	E. L. Ford
AKRON, OHIO	H. S. Firestone	GROSSE POINTE, MICH.	T. H. Newberry
AKRON, OHIO	F. H. Mason	GROSSE POINTE, MICH.	B. E. Taylor
AKRON, OHIO	Mrs. Etta Work	INDIANAPOLIS, IND.	H. McK. Landon
BETTENDORF, IOWA	J. W. Bettendorf	KANSAS CITY, MO.	J. W. Jenkins
CHICAGO, ILL.	A. H. Loeb	KANSAS CITY, MO.	William Pitt
CHICAGO, ILL.	C. H. McCormick	LAKE FOREST, ILL.	Finley Barrell
CHICAGO, ILL.	A. H. Meeker	LAKE FOREST, ILL.	Cyrus H. McCormick
CLEVELAND, OHIO	Albert M. Allen	LAKE FOREST, ILL.	Harold McCormick
CLEVELAND, OHIO	Frank Billings	LAKE FOREST, ILL.	Robert J. Thorne
CLEVELAND, OHIO	W. M. Clapp	MINNEAPOLIS, MINN.	F. W. Clifford
CLEVELAND, OHIO	F. E. Drury	MINNEAPOLIS, MINN.	A. L. Searle
CLEVELAND, OHIO	H. A. Fuller	OKLAHOMA CITY, OKLA.	C. B. Ames
CLEVELAND, OHIO	Abram Garfield	OMAHA, NEBR.	George A. Joslyn
CLEVELAND, OHIO	Samuel Mather	ROCK ISLAND, ILL.	Otto Huber
CLEVELAND, OHIO	W. G. Mather	TOLEDO, OHIO	W. W. Knight
CLEVELAND, OHIO	Edwin Heina	TOLEDO, OHIO	George R. Ford
CLEVELAND, OHIO	W. R. Jeavons	WALKERVILLE, ONT.	Tracey McGregor

OFFICE BUILDINGS

NEW YORK CITY	Consolidated Gas Company	CHICAGO, ILL.	Adam Schaaf Piano Co.
BOSTON, MASS.	Merchants National Bank	CINCINNATI, OHIO	Citizens National Bank
BOSTON, MASS.	New England Telephone & Telegraph Co.	CLEVELAND, OHIO	Citizens Savings & Trust Co.
ANDOVER, MASS.	American Woolen Company	CLEVELAND, OHIO	Cleveland Discount Building
PHILADELPHIA, PA.	Sears, Roebuck & Co.	CLEVELAND, OHIO	Guardian Bank Building
HARTFORD, CONN.	Hartford Fire Ins. Company	DAYTON, OHIO	Daily News Building
HARTFORD, CONN.	Phoenix Mutual Life Ins. Co.	DETROIT, MICH.	Michigan State Telephone Co.
HARTFORD, CONN.	Phoenix Insurance Company	KANSAS CITY, MO.	Chambers Building
HARTFORD, CONN.	Orient Insurance Company	KANSAS CITY, MO.	Federal Reserve Bank
BALTIMORE, MD.	B. & O. Railway Annex	KANSAS CITY, MO.	Irving-Pitt Mfg. Co.
AKRON, OHIO	B. F. Goodrich Co.	MONTREAL, CANADA	Grand Trunk Offices
BUFFALO, N. Y.	Larkin Soap Company	OKLAHOMA CITY, OKLA.	Morris Co. Offices
BUTTE, MONT.	Metals Bank Building	OKLAHOMA CITY, OKLA.	Oklahoman Building
CHICAGO, ILL.	Carson, Pirie, Scott & Co.	SPRINGFIELD, ILL.	Franklin Life Insurance Co.
CHICAGO, ILL.	Chicago Telephone Company	TOLEDO, OHIO	First National Bank
CHICAGO, ILL.	J. T. Ryerson Co.	TOLEDO, OHIO	Willys-Overland Co.
CHICAGO, ILL.	Sears, Roebuck & Co.	TORONTO, ONT.	Bank of Nova Scotia Building

INDUSTRIAL PLANTS

NEWBURGH, N. Y.	Du Pont Fabrikoid Plant	NAUGATUCK, CONN.	United States Rubber Co.
PARLIN, N. J.	Du Pont Film Co.	ROCHESTER, N. Y.	Eastman Kodak Co.
BUFFALO, N. Y.	Du Pont Fibre Silk Co.	DANVILLE, VA.	Dan River Cotton Mills
BROOKLYN, N. Y.	Julius Kayser Company	PATERSON, N. J.	Doherty & Wadsworth
CENTRAL FALLS, R. I.	Pennsylvania Textile Co.	AKRON, OHIO	B. F. Goodrich Co. (Dry kilns)
CLIFTON, N. J.	Doherty Silk Company	BARKSDALE, WISC.	E. I. Du Pont De Nemours Co.
EAST TAUNTON, MASS.	Connecticut Cotton Mills	BLUE ISLAND, ILL.	Libby, McNeill & Libby
HUNTINGTON, PA.	Susquehanna Silk Mills	CHICAGO, ILL.	Calumet Baking Powder Co.
NEW HAVEN, CONN.	Velvet Textile Company	CLEVELAND, OHIO	Cleveland Metal Products Co.
PASSAIC, N. J.	N. Y. Belting & Packing Co.	CHICAGO, ILL.	Fleischman Company
WORCESTER, MASS.	Morgan Construction Co.	CHICAGO, ILL.	Crane Co. Corwith Plant
MILTON, MASS.	Walter Baker & Co.	CHICAGO, ILL.	Wm. Wrigley, Jr., Co.
PHILADELPHIA, PA.	Proctor & Schwartz	CHICAGO, ILL.	Yellow Cab Mfg. Co.
HOPEDALE, MASS.	Draper Co.	CHICAGO, ILL.	Rothacker Film Mfg. Co.
CAMBRIDGE, MASS.	United States Rubber Co.	CHICAGO, ILL.	B. Heller & Co.

EDUCATIONAL

YALE UNIVERSITY	3 buildings	NEW BEDFORD, CONN.	12 schools
WELLESLEY COLLEGE	5 buildings	FALL RIVER, MASS.	11 schools
PRINCETON UNIVERSITY	6 buildings	CHICAGO, ILL.	21 schools
VASSAR COLLEGE	6 buildings	CINCINNATI, OHIO	13 schools
IOWA STATE COLLEGE	4 buildings	CLEVELAND, OHIO	21 schools
UNIVERSITY OF ILLINOIS	5 buildings	DETROIT, MICH.	14 schools
NEW YORK CITY	17 schools	INDIANAPOLIS, IND.	10 schools
PHILADELPHIA, PA.	23 schools	OAK PARK, ILL.	10 schools
BOSTON, MASS.	11 schools	OKLAHOMA CITY, OKLA.	12 schools
YONKERS, N. Y.	19 schools	SIOUX CITY, IA.	9 schools
NEW HAVEN, CONN.	16 schools	PORTLAND, ORE.	9 schools
SCHENECTADY, N. Y.	15 schools	TORONTO, ONT.	15 schools
SYRACUSE, N. Y.	12 schools	HAMILTON, ONT.	10 schools
NEWARK, N. J.	16 schools	JOLIET, ILL.	8 schools

PUBLIC BUILDINGS

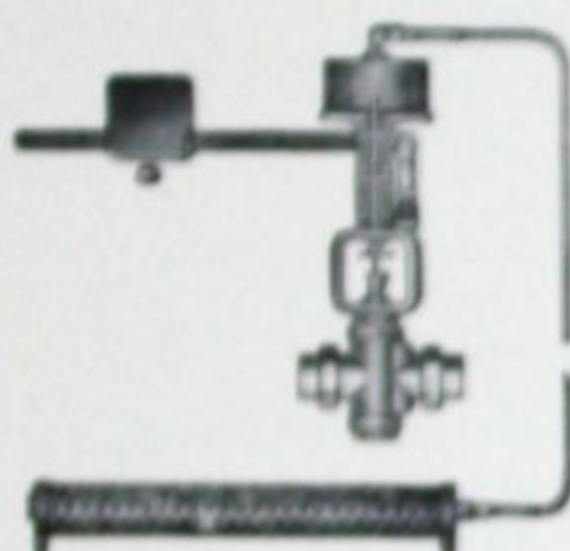
WASHINGTON, D. C.	U. S. Dept. of Agriculture	NEWARK, N. J.	Newark Athletic Club
WASHINGTON, D. C.	U. S. Bureau of Standards	ANN ARBOR, MICH.	Michigan Union Building
NEW YORK CITY	U. S. Post Office	BUTTE, MONT.	Silver Bow Co. Court House
NEW YORK CITY	U. S. Custom House	KANSAS CITY, MO.	Kansas City Athletic Club
NEW YORK CITY	Bronxboro Court House	CHICAGO, ILL.	Field Museum of Natural History
NEW YORK CITY	Grand Central Terminal	CHICAGO, ILL.	Lewis Institute
NEWARK, N. J.	County Court House	CHICAGO, ILL.	Sinai Temple and Social Club
BOSTON, MASS.	Federal Reserve Bank	DETROIT, MICH.	Detroit Public Library
BOSTON, MASS.	Boston Opera House	OKLAHOMA CITY, OKLA.	State Capitol Building
BOSTON, MASS.	Stock Exchange	SPRINGFIELD, ILL.	Supreme Court Building
SPRINGFIELD, MASS.	Municipal Buildings	ST. PAUL, MINN.	State Capitol Building
PHILADELPHIA, PA.	Masonic Temple	ST. PAUL, MINN.	St. Luke's Hospital

Temperature Control for Industrial Processes



No. 14-B Regulator

Compressed air operated rigid stem regulator, adapted particularly to cooking and heating operations requiring great precision of control.



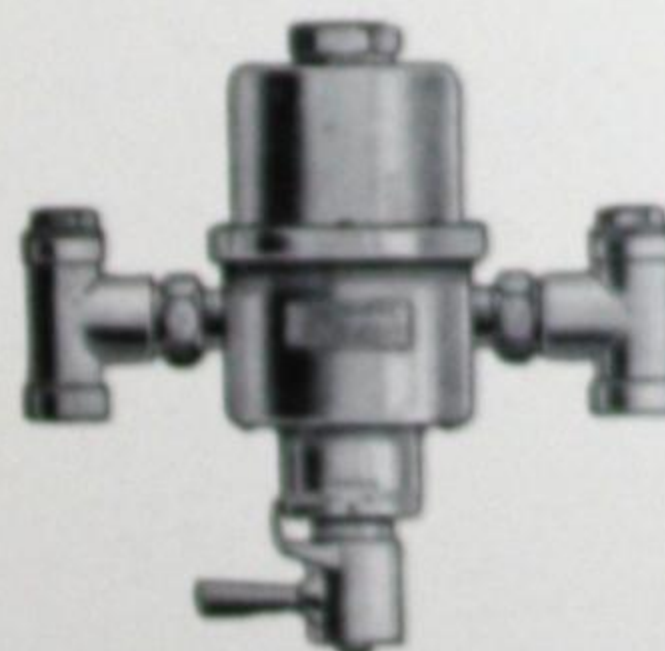
No. 15 Regulator

A self-operating regulator for controlling atmospheric temperatures. Adapted to drying rooms, lumber kilns, varnish driers, enameling ovens, and similar uses.



Dial Thermometer

For industrial temperature indication—accurate, readable.



Thermostatic Water Controller

For group showers, water processing, etc.

Wherever heat is used in industrial processes improved results follow its automatic control. Not only is fuel economy secured, but the product itself is in nearly every case improved if processed under the *right* temperature.

A great labor saving is effected by the use of such automatic control and it is no infrequent experience that the use of a Powers Regulator releases a man for other work.

We manufacture for this industrial field a varied line of temperature controlling specialties that are reliable and extremely effective. It is a field separate and distinct from the building equipment described in this book and to cover same we issue printed matter in bulletin form that is of extreme interest to practically all manufacturers. We illustrate here a few only of our more standard specialties.

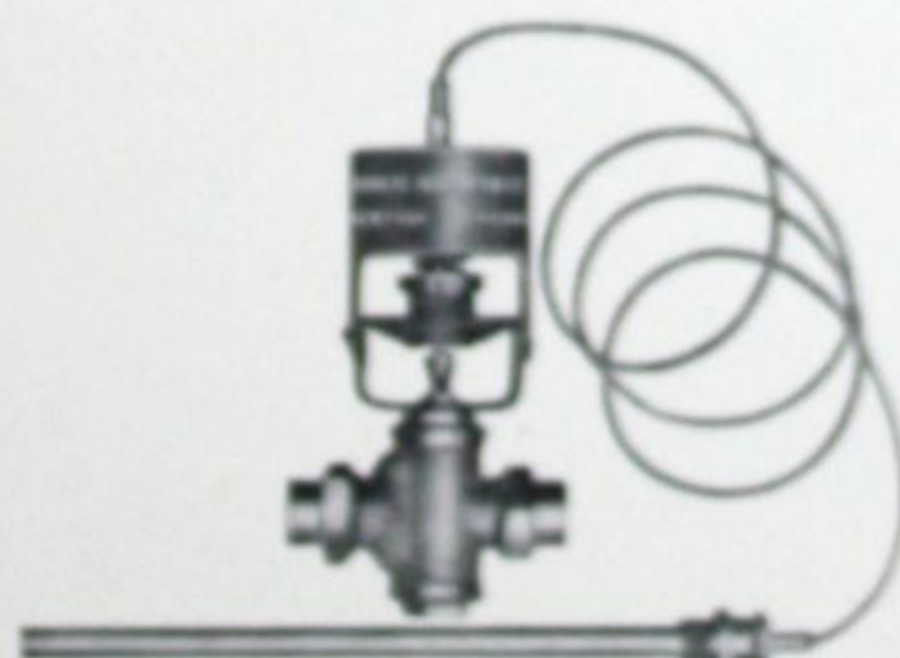
We will be glad to send our bulletins to parties interested in this subject.

The Powers Regulator Company

Specialists in Automatic Temperature Control

New York

Chicago



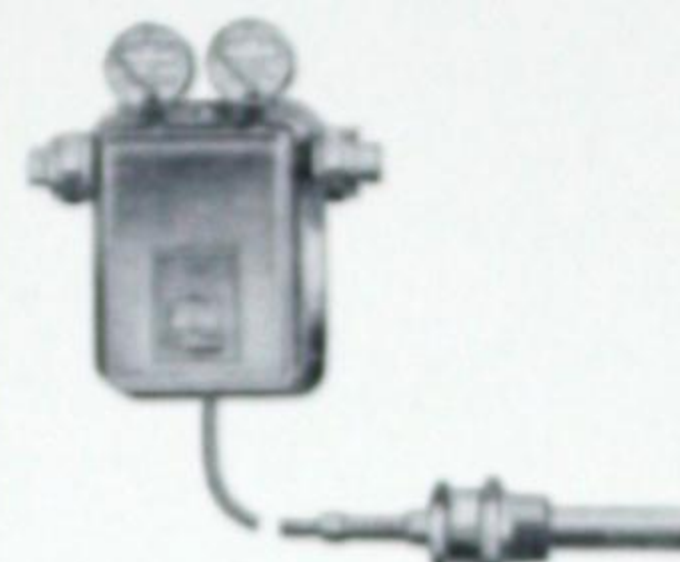
The No. 11 Regulator

A perfect control for steam heated domestic hot water service tanks and heaters. Self operating.



No. 16 D Regulator

For control of steam or gas heated compartments.



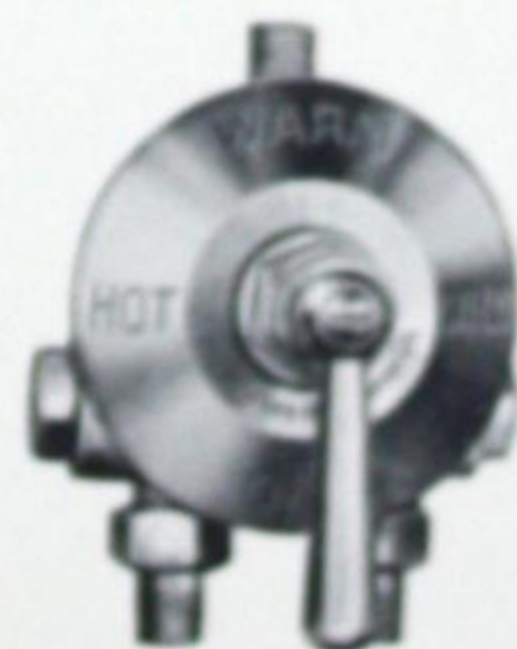
No. 21 Regulator

Compressed air operated regulator with flexible extension of thermostatic bulb. Adapted to industrial cooking and drying operations, candy making, also liquid temperature control under many conditions. Very accurate.



No. 16 Regulator

A self-operating regulator for steam or gas heated cooking vats and similar uses.



Shower Mixing Valve

Eliminates entirely the unexpected and undesirable temperature changes so common in the ordinary shower bath.

Rigid Service Standards — Throughout Country

All Powers Temperature Control Systems are sold on the basis that proper installation is an essential factor of the completed system. From the standpoint of operation, perfection in installation methods is quite as important as the actual apparatus used. We will not sell a temperature controlling system except as a complete installation, made by skilled workmen educated and trained by ourselves.

These competent erecting engineers work under the direction of our branches, located in various cities, throughout the United States and Canada. A glance at the list below will give an idea of the completeness with which we cover the territory.

These branches are organized to give personal and expert service to every user or prospective user of Powers Systems. They have engineers who are widely experienced in the application of temperature control to heating and ventilating systems. It is a part of their work to advise and suggest as to the best equipment for different purposes.

In judging an organization, the service given to its customers is of far greater importance than the number of customers served.

ENGINEERING SERVICE

The business of the Powers organization is not only to furnish Automatic Temperature Control but to insure that the users get the service from it that they have a right to expect. The service rendered by the company is of great importance to our clients covering as it does not only the proper installation of our apparatus but the continued successful operation of it. Powers Service extends therefore throughout the life of the apparatus, which must necessarily be the life of the building in which it is used.

While the experience as expressed by our clients over periods of many years gives eloquent testimony to the durability of our work, it can not be assumed that the user will never require our help. Changes may be made in heating systems, alterations in buildings, additions, etc., so there is necessity that an organization like ours shall be available when needed.

Powers Systems are not ready made, the principles and the apparatus are standard but each job receives special treatment and study. With our large corps of engineers located in the principal cities we are able to fit each system to the particular work that it has to do, thereby assuring the buyer the worth of his money.

For this reason, consultation with our engineers is a fundamental part of Powers Service that must precede any contract that we make.

This consultation service is rendered gladly, in your interest and our own. Please feel free to avail yourself of it.

The Powers Regulator Company

New York Chicago

BRANCHES AND SERVICE STATIONS

Boston
Cincinnati
Detroit
Des Moines
Minneapolis
El Paso

Cleveland
Buffalo
Rochester, N.Y.
San Francisco
St. Louis
Pittsburgh

Seattle
Kansas City
Salt Lake City
Indianapolis
Charlotte, N. C.
New Orleans

Los Angeles
Butte, Mont.
Milwaukee
Portland, Ore.
Baltimore
Philadelphia

Canadian Powers Regulator Company, Ltd.

Toronto, Ont.

Branches—Montreal, Winnipeg, Calgary, Vancouver, Halifax

